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ENGINEERING AND MINING JOURNAL

A Weekly Journal of the Mining and Mineral Industries

February 14, 1920

McGraw-Hill Company, Inc.

Largest Circulation of Any Mining and Metal Journal in the World

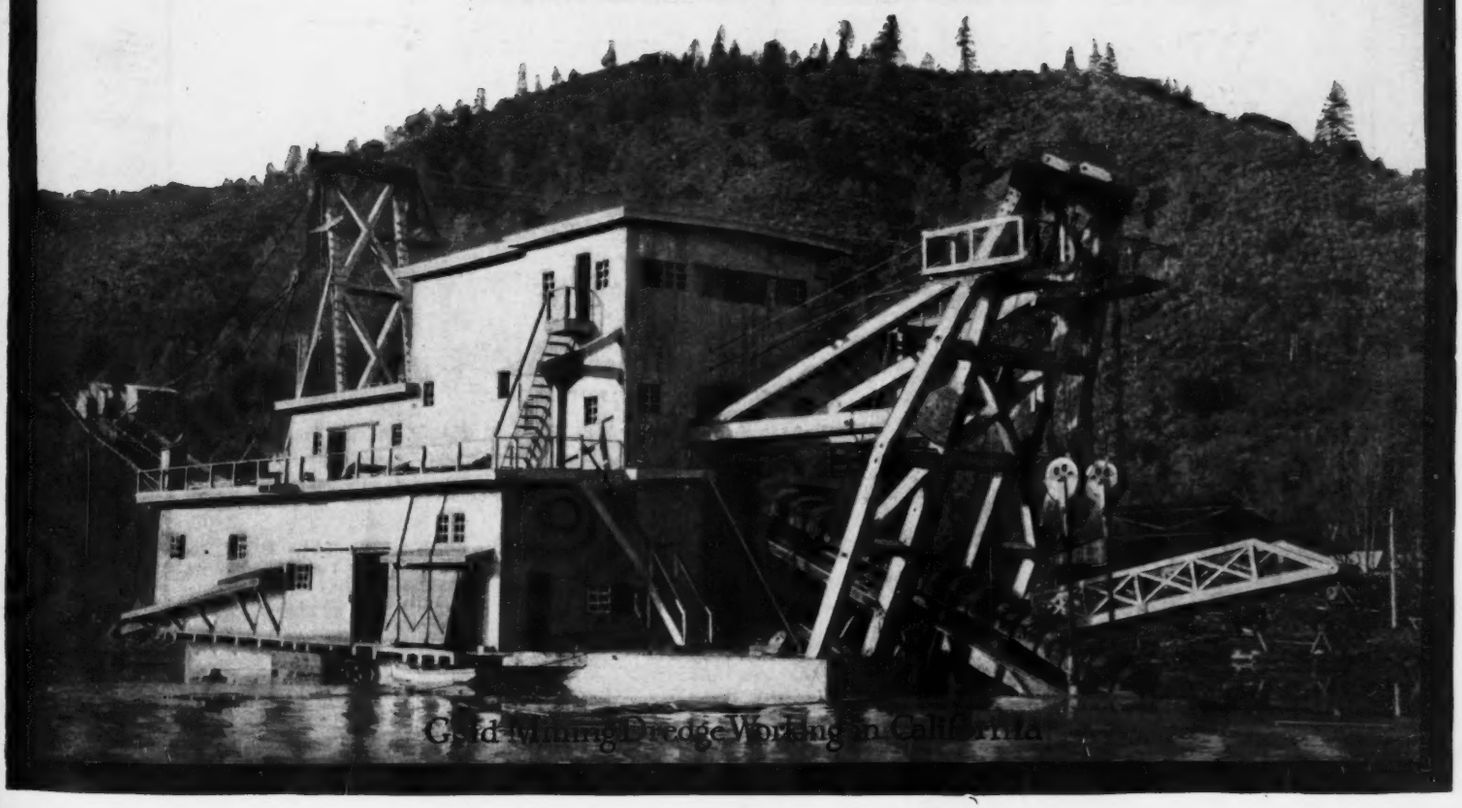
New Mining Control in Ontario
by J. B. Tyrrell

Gold Mining in California
by George J. Young

Inefficiency and Poor Food of Mexican Miners
by C. H. Grabill

Airplanes in Mining Operations
by Eugene Shade Bisbee

Editorial
The Price of Metals



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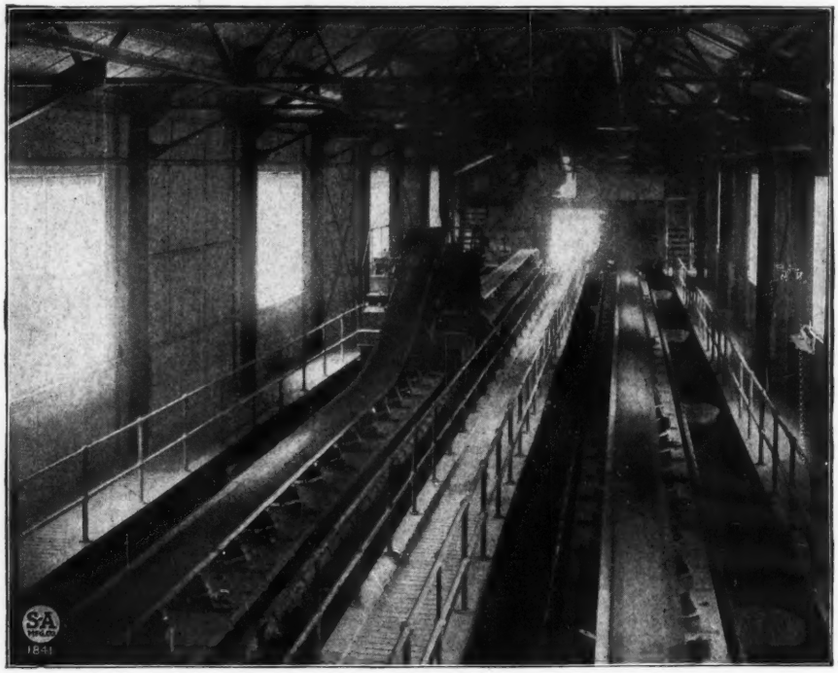

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"WE KNOW about Russia. We know about Bolshevism. We know the piteous story of cruelty and intolerance and we know the autocratic concept that underlies the minority dictatorship—which is hailed to the world by its dupes and advocates as the most perfect state of society yet devised. We know about it, and we condemn it completely, finally, and for all time." —*Samuel Gompers, Jan.* 28, 1920.

The Price of Metals

THE price of metals is as variable and difficult to fix with accuracy as that of potatoes or apples. It is far more difficult than in the case of wheat or corn, pork or coffee, stocks or bonds. All these are dealt with principally in exchanges, are bought and sold back and forth, on paper, for speculative purposes or for consumption; and the consequence is definite quotations and an established and universally recognized standard.

The metal business of the United States is one of the largest basic industries, and the metal business of the United States is the largest in the world, England coming next. The two great metal markets of the world are, therefore, New York and London. In London metals are dealt in freely on the Metal Exchange, by speculators, middlemen, and consumers, with the result that a uniform daily quotation is available for London metal markets.

In New York the market situation is complex. There is no recognized and frequented Metal Exchange. A Metal Exchange was organized May 7, 1883, with the idea of making it the New York metal market, but the plan never succeeded. At present this organization obtains and furnishes some excellent statistics, especially of imports and exports of metal, and London prices—notably of tin and silver. No sales, however, are *officially* transacted in and through it; although at 1 o'clock daily it makes metal quotations through a "call" participated in by minor dealers. These quotations do not pretend to take into account the main metal market, nor are any volumes of transactions, or even any transactions, taken account of; but these nominal prices, issued daily, are available to the evening papers, and are quoted by them as the day's metal prices. Nevertheless, these prices are negligible as a means of computing the average quotation of the whole market, and no pretense otherwise is maintained by the Metal Exchange.

A much more important factor in the New York metal market is the brokerage firm of C. S. Trench & Co. Mr. Trench is experienced for many years in the metal business, and has a staff of trained assistants who are specialists each in his own metal. This firm issues the daily bulletin called the *American Metal Market,* which, originally published as a broker's circular, has developed into a valuable daily review of all phases of the market as far as these are accessible to the editor as a broker. A large volume of business is actually transacted through this house, and therefore its comments on the American metal market are valuable and interesting. The largest business (relative to the whole market) is done in zinc and tin, a relatively minor business in copper; and very little in lead. In the market descriptions of copper, lead, and zinc, one may find various prices quoted—for the producer's market and the "outside market"—and finally are recorded the prices fixed by the Metal Exchange. The last named are treated as nominal; the market which is represented by Trench & Co. is the "outside market"—outside in that it is outside the big or major market, which is the "producers' market."

To explain the "producers' market" as termed by Trench & Co., let us recall that the smelting, refining, and selling of metals in the United States are concentrated mainly in the hands of a few large and wide-extending financial groups. One may count on the fingers of one hand the groups which together control 85 per cent of the country's copper, or lead, or zinc. (This is common to most of the metals—for aluminum, for example, one may close the account with one finger.) These great "producers," situated close together in New York, are averse to selling to middlemen, or "speculators," as frequently termed; probably 90 per cent of their sales are made direct to the consumers. The great consumers, again, are relatively few in number—certain great manufacturing organizations use the bulk of the metals produced; so that the producers dispose to the consumers of vast quantities of metals in relatively few transactions. The producers deal with brokers reluctantly or not at all; and therefore their prices filter but imperfectly through the "outside market" and the volume of their transactions does not become known.

No domestic selling combination for domestic consumption exists between these great producers; the different groups are sharp competitors.

For export business, under the Webb Act, such a selling combination, as regards copper, has been formed—the Copper Export Association. For domestic business, however, the distinction is clear and the competition active; and the different sellers are usually quite opposed to their competitors knowing the extent and price range of their transactions. They must, however, both buy and sell on some standard; and long ago the *Engineering and Mining Journal* quotations were adopted and recognized as a standard. On this basis they buy most of their ores and metals; on this basis their principal customers (the great manufacturers) largely buy metals from them. A common form of contract between the "producer" and the "consumer" is for a certain speci-

fied amount of metal monthly, to be paid for on the average *E. & M. J.* quotations for the month. Through contracts between the miner and the smelter (who represents or is the "producer" in this discussion) the producer is therefore at the same time buying and selling on these quotations, which have remained for years satisfactory to both parties.

How are these figures arrived at by the *Engineering and Mining Journal?* The true quotation for copper, for example, is evidently the weighted average of all the copper which is sold on a certain day, following the principle familiar to all mining engineers in estimating average ore value from mine samples. In estimating the average value of the whole mine, an occasional high assay is not given full weight. We know of a case where a conscientious but untrained engineer estimated 25,000 tons of $9 gold ore in a mine. Inspection of his assay list showed one $300 sample and all the rest below $3. There was no ore in the mine. Transactions are weighted according to volume. If, for example, a "producer" one day sells 10,000,000 lb. of copper at 19¼c., and on the same day 100,000 lb. is sold in the outside market at 18⅞ or at 19½c., as the case may be, the average is changed very slightly above or below 19¼. Yet 18⅞ or 19½ will be the "outside market" quotation for the day, while the Metal Exchange figures, which record no transactions, but only a nominal "call," may be 18½—but are generally high as compared with both the minor "outside markets" and the major or "producers' market."

The *Engineering and Mining Journal* quotations, to be accurate, however, must give full proportionate weight to transactions in all markets; and this is actually done, and thus are modified in due proportion the figures derived from the transactions in the "major market."

On account of the responsible and service-rendering position of *The Journal's* quotations, as the main basis for transactions in the major market, the information as to prices and volume of business transacted by the main producers is divulged only to *The Journal*, and that only with the understanding that the exact details of each company's business are confidential, not only as regards the public but also as regards the other producers. The composite, assembled by *The Journal*, indicates the average quotation; when it feels unable to establish an average it indicates the range. As the mean between the ranges must needs be taken by both buyer and seller as a fixed basis for buying and selling, outer fringes of sporadic transactions, not affecting the general average, are eliminated. For example, in one day when *The Journal* established the average range of copper at 19@19¼c., sporadic sales were made in the outside market as low as 18¾c.; and were chronicled in *The Journal's* write-up, but not in its quotations of average prices. On the same day, the average range of lead was quoted at 8.50@8.75c., although one of the large producers stated that under exceptional circumstances he had sold a small lot of a special brand at a premium, making the price 9c. This also was mentioned in our write-up, but not included in the scope of our published estimate of average range.

Are the *Engineering and Mining Journal's* estimates then absolutely accurate? They are relatively so, especially as regards all other available quotations; but they cannot be guaranteed as perfect. Every week the principal producers and consumers are interviewed, and their helpful information is compared and checked and weighted. Many of these sources show letters, telegrams, or even books in evidence as to their statements or judgment. A very few, however, are specific as to prices, but reticent as to quantities, so that it is a matter of judgment as to what weight to give to their data, although supplied by men universally known as accurate.

The balancing of a large bid-and-asked market against small actual transactions for the day is a special problem in each case; especially, when the next day the bid-and-asked market for the day before becomes the basis for large actual transactions, how shall the average for the week be computed?

With all these difficulties, *E. & M. J.* quotations have remained standard, recognized by the courts and by the Government, and in general satisfactory to sellers and buyers alike. Some of the largest producers make contracts on *E. & M. J.* prices, providing for an adjustment if either party is dissatisfied; but such an adjustment is rare. The inherent unavoidable element of error, due to the lack of complete data, is held, by the most interested, to be largely compensating; and this has been demonstrated by periodical checks of actual prices received by the large producers against *The Journal* quotations.

Democracy and the Engineering Societies

DEMOCRACY is a relative conception: it is an ideal unobtainable in its absolute form, but toward which Americans and other individualistic and liberty-loving peoples continually strive. Absolute democracy becomes further removed from practicability in proportion to the backwardness of the average individual; even relative democracy is impossible in Africa, questionable in Mexico—most nearly realizable in the United States and Canada, England, France, Switzerland, and Norway. The theory is that if all citizens were advanced in intelligence and experience the nearest approach to an ideal democracy would be feasible.

Where shall we find a body better answering the test of uniform citizenlike potency than the engineers? We like to think that, and we do think it.

In the light of this, the system of government adopted with some uniformity by our great engineering societies is interesting—perhaps prophetic.

We have before us the ballots for two great societies, the American Institute of Mining and Metallurgical Engineers and the Geological Society of America—ballots which the members are privileged to cast once a year, to determine their presiding and (yes, that is the correct word) governing officers. In the board of directors of the Institute, in the Council of the Geological Society, the questions of the respective societies are debated, settled, and put into effect. But the members may elect their representative body? They may, if they wish to waste their time in going through the prescribed motions; it is like filling out and sending in to a stockholders' meeting your proxy for 100 shares of Steel Common. For each of the ballots to which we refer above gives us the opportunity for voting for one out of one.

"Dinner is served, sir," said the polite waiter to the newcomer in the mining town. "Will you have beans, sir?" "No, thanks, I don't care for beans." "In that case, sir, dinner is over, sir."

Each ballot is the official ballot prepared by the incumbent governing body, naming its successors. A deviation from this "regular slate" is theoretically possible,

but ordinarily not practicable, especially where it is not desirable—as in the present instances, where the candidates are chosen so wisely.

Our text, however, is democracy and the engineer as a test case. As a working model of a community ideally fitted for democracy, what system of government have we adopted? It is not a democracy, except in outward form, like the government of Mexico or Guatemala. The invitation to vote for one of one has the same relative weight in both cases. It is, then, an oligarchy. An aristocratic oligarchy? We cannot admit this, if we adhere to our appraisal of engineers above—all are intellectual aristocrats. In a way, a self-perpetuating oligarchy, which determines its own successors, whether new members or old.

We are very well satisfied with this form of government—and so are engineers in general. We flourish under it; and that is what worries us—because what we like is not always good for us. The tendency to ruling cliques, even to a dominating "boss," is as marked in scientific societies as it is in outside politics. What thoughtful man but has noted curiously this tendency in city and national affairs? A recent English university expert stated that the chief difference he observed between England and American universities was the democratic system in the former, and the autocratic systen in the latter.

What augury may one make for the future of America from these indications? Will it follow the law established by the republics of Greece and Rome, and pass from a virile and individuality-asserting democracy to a prosperous and orderly community, well governed by professionals, and so on to a gradual decay?

Konserning Fonetiks

FROM various reliable printed sources we note that Mr. Walter Shockley's effort to get a popular vote on the question of spelling reform from the American Institute of Mining and Metallurgical Engineers has evoked a storm of "irritation," "vituperation," and even "profanity" (we like the baffled crescendo of the above). No voice is raised in his support, except now and then a voice crying in the wilderness.

You do not irritate us here on *The Journal*, dear Mr. Shockley. You give us joy and pride. We thrill to you as we do to the hero of "When Knighthood Was in Flower"—to the armored champion who flings down his gauntlet against the field in defense of Truth and Progress. Your name is the very name an author should choose for such a champion, riding valiantly to all jousting shocks. We envy you; but we would not dare to emulate you or even to support you. It would put us out of business, and we shall vote against you.

It is quite truly urged against you that it is not the job of the engineer to bother about spelling reform; that is up to—let us see—the other fellow. Not up to *The Journal*—oh, no! We beg to be excused. We prefer, anyhow, the hallowed and inspired orthography of the Scriptures: the spelling of Shakespeare and Milton is good enough for us. What's that? Shakespeare and Milton are among *your* authorities? How irritating you are, Mr. Shockley! Please do not interrupt. We would not willingly lose the wealth of etymology that comes to our mind when we write *though, through, thought, brought*, and so on; instead of your exposed and indelicate, *tho, thru, thot*, and *brot*. The *ough* reminds us, as every child knows, of our dear Teutonic ancestors who had the same delightful guttural sound in speaking these words which now delights us when we hear the Germans say *doch, durch, dachte*, and *brachte*, and which we now only make when we clear our throats preliminary to expectoration.

Have you, moreover, thought of the industrial chaos involved in your proposals? Take only the four words above cited. You propose to reduce 27 letters to 15—a nearly 50 per cent decrease. We have calculated that this combination is written or printed in the United States alone in one year 327 million billion times; that the cutting down of the length of the written or printed words by one-half would mean the throwing out of employment, for pencils alone, of 240,000 lumbermen; would cut out the market for 31,242 tons of nickel and 40,000 tons of rubber. Fifty per cent of our graphite mines would close down. The reduction on wear and tear on fountain pen points would further limit the demand for gold and further increase the sad plight of that industry. The amount of paper to which the Sunday newspapers alone would be reduced would throw spruce lumbermen out of work on 320,417 acres of pulp wood. The reduction of the wear and tear on the necessary garments of proof-readers and editors would reduce the demand for trousers so that the price would drop, and many a worthy Goldstein would not buy his new spring car. One less editor for each journal would be necessary, and that one might be us! Avaunt, Mr. Shockley! You would put us out of business! The Teachers' Branch of the American Federation of Labor, the National Society of Editors—in fact, all organized labor—is against you!

It is true that the French and the Spanish, through their learned academies, reformed long ago their spelling, eliminated the obsolete letters that stood for obsolete sounds, and so produced the languages we rejoice in. It is true, as we read in the morning's paper, that the Chinese government has adopted a phonetic system (mark the ph in *phonetic*, which signifies, what every child should remember, that the combination, though pronounced like f, represents the Greek f or phi, and that the word is derived from the same source as *phony*). To resume—it is true that the Chinese are now learning to read in a few weeks, where formerly it took four or five years to master the 40,000 characters. What of it? Remember your Anglo-Saxon heritage, Mr. Shockley. We are sprung from a race—the British—who, with a government more democratic than that of America, weep when they sing "God Save the King," because the king made their ancestors sing and weep a thousand years ago. The Chinese have cut off their pigtails, unbound their women's feet, discarded their writing system in which were contained endless treasures of tradition, history, and etymology; but are you prepared to eat in the dining car in your shirt-sleeves, to keep your hat on in church or for your wife to take hers off; to attend a grand banquet without your dress suit, or to doff your muddy shoes and enter your friend's home in your stockings?

The metric system, we have been given to understand by solid citizens, is an affront and an indelicacy. How much more respectable are troy and avoirdupois ounces, short and long tons! In Turkey they do it even better: the linear measure for such and such a length of silk is different, and with a different table, from that for cotton; and so on. That appeals to our Anglo-Saxon sense of fitness. We box our naughty children's ears.

and our appetites leave us, if they refer at table to pig meat; but as pork we gladly eat the pig. Why? For an excellent reason. When our Norman-French ancestors conquered our Anglo-Saxon ancestors a thousand years ago, French became the language of the gentry, Anglo-Saxon that of the laborer. Thus, to use French instead of Anglo-Saxon words became refined, and the reverse became even indelicate. You would even now be kicked out of any respectable company if you used certain ancient and honorable Anglo-Saxon words instead of their French or Latin synonyms. If you use them in a public speech or in a book, you would be fined and imprisoned.

Therefore we advise you in all kindness, Mr. Shockley, "Back up!" (or "Back down," whichever is correct —"Retire!" to be elegant.) Roosevelt was up against it like you—and backed down. Do you remember the indignation he aroused by espousing the principle of spelling reform when he was President? We remember defending him then against the attack of one of our friends—a college professor. We shall not defend you. Certainly, this that you propose is no business for engineers—any more than the metric system. We must be—oh, so careful! Back down—or go to Asia. The next century may belong to Asia.

"Look East, where whole new millions are
In Vishnu land what Avatar?"

The Statistician and the Gold-Mining Problem

OUR editorial of Nov. 15 on "The Gold-Mining Problem" was submitted by one of our subscribers to a great statistical organization, and we have been permitted to look over the reply. The writer takes exception to our somewhat philosophical statement that the United States is gold-bankrupt, but acknowledges it in the first sentence of his analysis: *"Even though the Government would not be in a position to exchange gold for all of this outstanding currency,* it is nevertheless backed up by the very highest type of security." This security is "the best class of rediscounted paper" and "Government bonds" and "credit of the banks issuing the note." Totaling the figures he gives us, we find roughly nearly six billions of currency in circulation, of which about one and a quarter billion is gold and silver coins, the remaining four and three quarter billions of paper currency being secured by a little over one and three-quarter billions in gold, with a little silver.

A person or corporation is bankrupt, as the term is commonly used, when unable to pay his or its debts. If all holders of paper dollars should demand real money or gold dollars, at once, the country would find itself nearly three billion dollars short of the ability to meet its debts on the basis of its outstanding currency alone.

The situation is evident to any but a student of banking and finance, who visualizes the dollar not as gold, but disregards the gold standard and conceives of the dollar as something intangible. One such writer claims that the gold coin is not money at all, but is of value only because it is a "promise to pay twenty dollars!" Such students will reply to us that the Government has back of it all the wealth of the country: therefore that its assets are vastly greater than its liabilities. On this theory, of course, a government could never be bankrupt, and so long as it controlled the country its paper I O U's would be worth their face value in gold. The fallacy of this theory is shown best in Europe. In Germany, with the government strongly in control of all the present and future wealth of the country, the mark, though on a gold basis, is worth one cent on the dollar. The German people and the world have decided, in the face of all theories, that Germany is bankrupt, and can pay one cent on the dollar.

England, by her premiums paid (in paper and other forms of credit) on gold imported from Australia and elsewhere, acknowledges herself gold-bankrupt. She cannot pay one hundred cents on the dollar.

Let us beware how we follow the will-o'-the-wisp of finance. The difference between Germany and the United States is one of degree. The fallacy of the impossibility of bankruptcy of a government is shown by Germany, and was shown long before by Turkey and other countries. Beyond a certain point the government cannot commandeer and confiscate the wealth of the country to make good its debts. Revolution or repudiation must eventually terminate the financial serial.

In the above we have taken no account of the outstanding debt of the United States, which amounts to twenty-six billions.

The statistical organization in question, after quoting the figures to show the decreasing production of gold in the world, which was 423 millions in 1917, 384 millions in 1918, and around 350 millions in 1919, states: "This decreased production tends to lessen prices." Certainly, as we explained in our editorial, this is theoretically true, and would be actively and positively true if gold were our real standard, and used in our current transactions. But the figures referred to above show that, out of nearly six billions currency extant, there is only one and a quarter billions of gold and silver currency; and out of this, it is our impression that the billion of gold coin is mainly kept in reserve or used only in major transactions by the bankers. Besides that, another form of currency is in enormous use—the check—which is the form of banknote based upon the drawer's deposit, which will be ordinarily another check, drawn by people who have deposited a third check in another bank, and so on. We have no idea as to the proportion of business transactions that are handled with checks instead of currency; but let us say 95 per cent. Say that the average man does 95 per cent of his financial transactions with checks (bank paper) and 5 per cent in currency, which will be 95 per cent Government paper. The chances are that he will not handle real money—gold—at all, and nothing of real value except a few silver coins. The result is that we do not use gold for money. It is substantially and for all practical purposes demonetized, and we think and deal in terms of the dollar of theoretical gold. These theoretical dollars have been multiplied, by the Government and the bankers, till they have lost their relation to the real value of gold, the standard; and whatever they may represent, in the way of mutual confidence, they have no fixed basis. To use our former metaphor, the balloon of credit is dragging its anchor of gold, already above the earth. The remedy is to increase the amount of real money of any kind in circulation, and buy and sell more on metal as a basis and standard, not "playing store" with nothing but paper scraps, like the children.

Selection of Engineers

THE selection of an engineer for a responsible appointment is of serious interest to both the employer and the employee. Employers of technical men, and young engineers who desire professional advancement, may ponder over this problem to advantage. The careful employer is usually on the lookout for a man who can fulfill not only the immediate requirements of the position, but also has capacity for further and larger achievement. The candidate who should seek the appointment is one who has the necessary training and experience to assume the responsibility with safety, and at the same time find in his new work incentives to activity and opportunity for professional growth.

Capacity for achievement depends on several factors. It may be born in the individual, or it may be the result of environment. If it is inherited it may manifest itself in numerous ways. One man may have a few well-defined traits, whereas another may have a variety of tendencies, and be versatile in his accomplishments. Again, one may exhibit a special aptitude for mental activity and accomplishment; another develop special skill or manual dexterity.

The successful technical man is he who has the ability to grasp and correlate ideas. His mind may be of the creative type or of the administrative type. The creative type of mind is the less complex, and is usually that of the scientist, artist, engineer, and professional man. The engineer must be capable of a high degree of mental abstraction. He must appreciate the relations between cause and effect, deal with and solve difficult concrete problems, and apply fundamental principles. He is likely to be individualistic in his tendencies. The administrative type of mind is that of the successful commercial man, who must deal more with personal relations than with abstraction. The first-class executive anticipates conditions, is a good mixer, and a practical psychologist.

If a man is not born with a capacity for achievement he may acquire it by education. Technical education should provide not only book knowledge of fundamental principles, but skill in applying those principles. The aim of technical education should be to produce experts. Purely academic training is good as far as it goes, but it should be supplemented by thorough first-hand knowledge gained by experience. Acquisition of learning should go hand in hand with the application of that learning to special problems. The well-trained engineer will analyze his problem, apply known principles in its solution, and then perhaps deduce new principles or discover new applications for the old ones. Principles can best be taught through their application.

Engineers, as well as others, require incentives to activity in order to accomplish more and better results. It is of interest to realize that few men work anywhere near their capacity. Therefore, many achieve only a fraction of what they are capable of accomplishing if they would put on more steam. The successful men who stand out prominently above their fellows are those who habitually work under high pressure, so far as mental activity is concerned.

The incentives which drive men on are various. The incentive of one man may be the mere pleasure of solving a problem. Another strives to win the respect and esteem of his associates. A third desires a reputation for filling his contracts and delivering results. Principle and duty are sufficient incentives for others, who gain maximum satisfaction in the knowledge that a duty has been well performed. Less highly organized minds may have such incentives as mere desire for wealth, or fear of the price of failure.

Habit is an important factor in an engineer's capacity. One of the worst habits is mental laziness or idleness. If old habits are bad, they should be replaced by new ones that will tend to develop fresh incentives to useful work. One of the best ways to form a new set of habits is to move into new surroundings and form new acquaintances and associates from among a set of entire strangers. A radical move into new surroundings may prove to be a valuable stimulation. It is sometimes better for a man to wrestle with the possibility of making a few new failures, than to sink into the monotonous life which may involve only the habitual dodging of old mistakes.

The engineer's capacity for success may depend on his fertility of mind to originate new ideas, and his judgment in selecting the most vital and effective ones for use. Both mental activity and practical experience have a strong cumulative effect. Every experience enhances the engineer's ability to achieve more. Every engineer has opportunity to acquire knowledge through study, assimilation, and deduction of fundamental principles; to accumulate skill through application of these principles to practical problems; and develop incentives to productive effort. His success will depend not a little upon his power to generate tireless enthusiasm and energy, and his ability to maintain a continual flow of worth-while ideas and impulses.

Efficiency of Mexican Labor

LABOR output bears a definite relation to food input. Labor efficiency is due in part to the experience and in part to the training of the worker, but, apart from these, where physical exertion is a conspicuous feature, the human machine must receive in the form of food an equivalent of energy equal to or greater than the energy yielded up to the job; otherwise there will be physical deterioration. This is a common-sense base for the study of efficiency.

In this issue of *The Journal* Clarence A. Grabill gives our readers another point of view on conditions in Mexico. It is based upon the foregoing principle. How much of the brigandage of Mexico is due fundamentally to the lack of sufficient food, both in quantity and kind, we cannot undertake to state, but we feel that it is one of the causes of the unsettled conditions in that country.

Americans are prone to consider Mexican labor as of poor grade, and inefficient, but we have not before seen an analysis of the causes such as Mr. Grabill presents. Speaking of fundamental causes of human inefficiency, we recall the case of the hookworm disease. We believe that labor inefficiency, excepting that form resulting from national disturbances engendered by the war, can usually be traced to a fundamental cause which requires intelligent handling for its removal. American managers of mines and smelteries in Mexico have it in their power to do constructive work for Mexico by looking into the food problem at their properties and remedying abnormal or poor conditions, both in the supply and utilization of food.

WHAT OTHERS THINK

Engineering, Latin and Greek

A letter entitled "Engineering, Latin and Greek," published in *The Journal* of Sept. 27, struck my eye. I say "struck" advisedly. I do not wish to become sarcastic, but the author has evidently attended two of our best institutions of learning, and yet has not received an education. The fault is not that of the individual, but rather that of the system followed by our higher institutions of learning.

Let us first define "education." Education means to draw out, from (Latin, e-duco). Development expresses the idea more clearly. Education means the development of a man. It is well expressed by the phrase, "mens sana in corpore sano" (a sound mind in a sound body). To be personal, my father left school at the age of ten years. He was a far better educated man than I shall ever be, even though I received my A. B. before beginning the study of mining. Combined with his knowledge of facts and fundamentals, he possessed a character developed by hard work and self-denial.

Under my definition of education, we may ignore and omit the question of education as a business investment. For, perhaps, education has little to do with business training.

Under the term "education," we can include such knowledge and training as will render a man capable of being a good man and a good citizen. Business training has little to do with this question; for how can we compare the surveyor with an assayer? Must we not compare them as men and as citizens?

The question as to the value of Latin: The value of anything is in its use; so if not used, most things are valueless. Under the scholastic system of education, which preceded our "elective" system, Latin was studied for its use. In the preparatory school, Latin, Greek, and French were studied, so that when the student entered the "poetry" class (freshman), he studied and compared the Latin, Greek, French, and English poets. In rhetoric (sophomore) class, he studied and compared the best orations of Latin, Greek, French, and English literatures. Then followed logic, and the study of literature. the comedies and tragedies of the different literatures. Then came philosophy and economics, and along with these courses of "culture," as some term them, were courses in science and mathematics (through calculus). The student was able to take a good course in science, as twenty-six hours a week were spent in class, against fifteen of the "elective" system.

I have written this much of the use of Latin, that I may be able to answer like the Yankee who answers by asking a question. Why not make Latin a requisite for entrance to all scientific schools and spend one hour each day in the study of Latin? Then the engineers of every country will have a common medium of expression. It will not be necessary to acquire one or more of the modern languages. The engineer, on visiting a foreign land, will be able to converse with the members of his profession. Again, Latin, being a "dead" language, is not subject to change; the ideas conveyed by the words are fixed; thus, scientific articles may best be written in Latin.

I have no idea that this proposal will be considered seriously, for today the study of Latin is considered to be of no advantage by the "Pan-Germans," and most Americans little realize how they have been filled with the German materialistic philosohpy, which has been propagated by the "elective" schools.

Regarding the fact that some men have been successful (or fortunate) in business after attending college, this is a repetition of the old fallacy, "post hoc, ergo propter hoc."

We are all given to this most common error of believing that because the first event preceded the second, the second happened on account of the preceding event—when, in reality, there may be no connection other than that of time between the events.

"The fault is not in the stars, but in ourselves, that we are underlings." JOHN F. LYON.

Los Angeles, Cal., Feb. 6, 1920.

The Tungsten Industry

The letter by Charles Hardy in *The Journal* of Jan. 3, p. 6, is interesting, not because it points to any new or unexpected conditions respecting all of the important war materials, but for the reason that its description of the present tungsten situation reads so true to form. It points out that a condition has been brought about in the tungsten trade which some engineers and others for eighteen months have insisted must sooner or later occur with all those metals and mineral products which can be produced more cheaply abroad than at home.

Without artificial pressure from some point, the former sources of ore will again become productive; these ores will go into their old trade channels, be manufactured again by the citizens who worked upon them prior to 1919, and will be sold the same traders who bought the finished goods prior to 1914.

The strange part of Mr. Hardy's letter is the seriousness of his desire that the laws of nature and trade should be artificially manipulated, so as to permit of the United States retaining the control of the tungsten situation that it held during 1918. You have explained why this was done with propriety in the case of magnesite and why it could scarcely be done in the case of those elements which are not found abundantly within our own territory.

The solution to this problem, and to several others almost identical, is given by Mr. Hardy himself when he writes, "others who have been in the trade are really and seriously considering whether their energy had not better be directed to other purposes before it is too late."

This is not a pleasant thought to any of us who have been interested in the production of the relatively new minerals or metals, and yet as a practical proposition we are up against that, or we must convince the majority of the American people that it will be profitable to subsidize production of these ores and metals.

New York, Jan. 25, 1920. F. F. SHARPLESS.

By The Way

Curfew at Bisbee

Bisbee, Ariz., has adopted a curfew law for the young. Every child under sixteen must be off the streets by 9 p. m., unless under escort. The mining camp is rapidly becoming a safer place to live in than the large city.

Unitania

"The United States and Britannia must unite on the metric advance," says the World Trade Club of San Francisco. The club is offering a prize of $1,000 for the best name proposed for the two countries united. This will be awarded May 15 next. "Unitania" is the prize winner to date. The Cunard Line, at least, may find in the new name something of interest.

The Camp Bird Deep Tunnel

Some time ago it was given out to the press that the Camp Bird, at Ouray, Col., was running its long deep-level tunnel to tap the vein in depth below the mine workings, and that a successful result was expected, in spite of the fact that J. E. Spurr, after a geological examination, had declined to recommend the driving of this tunnel. The tunnel is now completed, and it is reported—not to the press—that nothing has been found, and the mine has been shut down. After the expenditure of a quarter of a million dollars on this deep tunnel gamble, the directors in London doubtless have a higher appraisal of the value of applied geology than before.

Splitting the Nickel

That merchants may not continue to profit by the practice of absorbing the half-cent when purchases do not total an even cent, Representative Vestal, of Indiana, has introduced a bill providing for the coinage of a two-and-one-half cent piece, according to our Washington correspondent. His bill also provides that one side of the coin is to show a likeness of Theodore Roosevelt. The coin is to be composed of 95 per cent copper and 5 per cent of tin and zinc. But Mr. Vestal betrays an almost virginal innocence of buying and selling if he thinks that a two-and-a-half-cent piece will block the nefarious game of the predatory profiteer.

After the Gold Rush

"In failing gold industry, and the gradual abandonment of placer ground to Chinamen, there is abundant pathos," wrote Clarence King, of California, in 1860. "You see it in a hundred towns and camps where empty buildings in disrepair stand in rows; no nailing up of blinds or of closing doors hides the vacancy. The cheap squalor of Chinese streets adds misery to the scene besides scenting a pure mountainous air with odors of complete wretchedness. Pigs prowl the streets. Every deserted cabin knows a story of brave, manly effort ended in bitter failure, and the lingering stranded men have a melancholy look as of faint fish the ebb has left to die. . . . The '49 rough still stays on in almost every camp. He evaded the rope by joining the 'Vigilants' and has become a safe and fangless wolf in sheep's clothing. He found early that he could sponge and swindle a larger amount from any given community than could be plundered, to say nothing of the advantage of personal security. But now all these characters are few and widely scattered."

Assayers and Chemists, Attention!

"Under the new prohibition law," writes our Lordsburg correspondent, "*no one* may have in his possession any appliance that may be used for distillation purposes without being subject to fine and imprisonment. Almost every mine assay office has a still for making distilled water, especially if they make 'slop' assays for copper. Such appliances are an absolute necessity and naturally most plants would continue using them, with no thought of having been made criminals thereby. Some day some zealous deputy marshal is liable to wander in and pinch the whole works, and thereby cause a lot of trouble to innocent folks. Why not, in the usual spirit of helpfulness, have *The Journal* take the matter up with the powers that be in Washington and get a ruling and an arrangement for permits, and at the same time warn the innocent criminals of the consequences of having in their possession such a heinous instrument as a still, even though it may be used for such an innocent purpose as the purification of that which a fanatical minority would force down our throats?"

Line Forms on the Right

We republish in part, without charge, the following advertisement from *The Washington Post.*

ARIZONA COPPER.
Orion Gold and Copper Company,
Maricopa County, Arizona.

Chrysacolla (malachite and azurite) copper ore.
Sulphuriatic process used for extraction of copper at a cost of $2 per ton, thus doing away with freight and smelter charges. Bona fide and worthy of investigation.
Limited number of shares at 40 cents per share.

The "Arizona Copper" is no doubt for the purpose of attracting attention. Stockholders in the well-known company bearing this name, for example, might think an extra dividend was to be announced. The reason for "Orion" is a little harder to determine. The Hebrew word for Orion also means "fool," and this is significant. Also Orion in Greek mythology was a beauteous and mighty hunter, and it may be that this company may have to hunt for an adequate supply of ore. Or, to be prodigal in our references, the principal star of the Orion constellation is of a coppery red color, and, therefore, the name might be thought appropriate for a copper company. "Gold" should, of course, have been omitted from the corporate name, mining for that metal being somewhat unpopular just now. Still, with the impossibility of exchanging a $10 note for a gold-piece, the possibility of obtaining the metal from the ground will, no doubt, appeal to some.

Chrysacolla is, doubtless, the fault of the stenographer or typesetter. We can hardly believe that it is a new blanket term for malachite and azurite, as indicated. As to the sulphuriatic process, we think prospective stockholders should be entitled to a comparison of this euphonious process with the cyanmalgamatic or the hydroidiotic method. Anyway, $2 a ton seems high. The milling cost at Ray, if we remember right, is only about a dollar. This is easily compensated for by the abolition of freight and smelter charges, however. That the process is "worthy of investigation" we agree.

The exact location of the mine is not divulged other than that it is in Maricopa County. Hassayampa Creek flows down through the middle of this county and may furnish the drinking water for the company officials when visiting the property.

New Mining Control in Ontario

Recently Elected Government Controlled by Farmer and Labor Elements—Minister of Mines a Locomotive Engineer—Head of Health Department a Broom Maker and Labor Editor

By J. B. Tyrrell
Written exclusively for the *Engineering and Mining Journal*

THE recent general election for members of the Provincial Parliament of Ontario has developed a set of conditions which may have a material bearing on our mining industry, and, in consequence, the great body of mining men in the United States, who may occasionally turn their eyes northward toward Canada, may be interested in knowing those conditions, and in watching the results to which they will lead.

First let us enumerate the personnel of the government. It consists of a Lieutenant-Governor, appointed for a term of years by the Federal Government of Canada; a number of ministers known respectively as Provincial Treasurer, Provincial Secretary, Minister of Agriculture, Minister of Mines, Minister of Labor and Health, Minister of Education, and heads of other departments; and a House of Parliament or Assembly, composed of 110 members all told, including the ministers, elected by the people for a term of not more than four years. The ministers preside over the various departments. They represent constituencies, and must be elected the same as other members of the House, and in order to continue to hold office must be supported by a majority of its members. They are assisted and served by deputy ministers, technical officers and clerks, who are permanent members of the Civil Service, removable only for cause.

Administrative Procedure

When the House withdraws its support from a ministry, usually as the result of an adverse popular election, the Lieutenant-Governor chooses a man to be Premier, usually the leader of the party with the largest following in the House, and he, in turn, nominates the various ministers who are to serve with and under him in the direction and control of the more or less independent departments.

Up to the present the Premier of Ontario has always been a lawyer, and many if not most of his ministers have been members of the same profession. They have usually been trained speakers, accustomed to express themselves fluently, and although they may not have known anything of the class of business transacted by the departments over which they were appointed to preside, they were accustomed to act as intermediaries between the public and those departments, and if interrogated in the House they would obtain information from the permanent officials under them, and communicate it to the members. Most of them had had little executive experience, and they were inclined to leave to others the administration of the laws which they caused to be passed.

Previous to the last general election most of the members belonged to one or the other of two parties, known respectively as "Conservatives" and "Liberals," though there was also a small group of men who styled themselves the "Labor" party. At the same time in the smaller towns and throughout the rural sections a new party was being formed which called itself the "United Farmers of Ontario," or "U. F. O.," quite independent of either of the old organizations. It was not committed to any definite platform, but, though it supported the temperance legislation of the last government, expressed a general dissatisfaction with prevailing conditions.

Success of the United Farmers' Party

To the surprise of many, including not a few of the farmers themselves, the returns of the voting as they came from the polls showed that the new United Farmers' party had beaten both the Conservatives and the Liberals, and if combined with the "Labor" party, would have a majority in the House over both the old parties together. The combination was quickly effected, and the Farmers' party was immediately recognized as being in control of the political situation. Only two of the men elected belonging to it had been in the House before, and not one had had any ministerial experience. Apparently none of them had made any preparations for assuming the reins of government, and they had no recognized leader. However, they soon chose as their leader E. C. Drury, who owned and personally managed a large stock farm. He had not been elected a member of the House; in fact, he had not even been a candidate at the election, but his father had been Minister of Agriculture a number of years ago, and he himself had for some years been actively engaged in promoting the organization of the farmers into a party.

The Conservative government which had been in power for a number of years then resigned, as it had lost the support of the majority of the House, and the Lieutenant-Governor called on Mr. Drury to choose his cabinet and form a government. This he has been successful in doing, with the help of the "Labor" party, cementing his agreement with it by appointing two of its members to seats in his government. Thus Ontario has been furnished with a new ministerial department, most of the members in which are actually operating farmers, and two of whom are representatives of labor, and one, the Attorney-General, is, according to statute, a lawyer. (Should not another statute be passed enacting that the Minister of Mines must always be a mining engineer, the Minister of Agriculture a farmer?) To complete the entire change of government a new Lieutenant-Governor was appointed by the Federal Cabinet to take the place of the old one, a lawyer, whose term had expired. The new appointee is a business man.

The two governmental departments in which those of us who are engaged in any branch of the mining industry are most directly interested are Mines and Labor, and these are presided over by the two Labor representatives referred to above, with the titles of Minister of Mines and Minister of Labor and Health. The former is a locomotive engineer who was elected in Port

Arthur, in the northwestern portion of the province, and the latter is a broom maker and editor of a labor paper who was elected in the city of Hamilton. As far as I have been able to learn, neither of them had ever been in any of the great producing mining districts of northern Ontario. These mining districts had elected either Conservatives or Liberals as their representatives in the House, and such men were not eligible for seats in the executive Cabinet, for the new Premier would have nothing to do with supporters of either of the old parties.

However, the new Minister of Mines is a man of intelligence, and he has as his Deputy Minister T. W. Gibson, one of the most capable, hard-working and efficient officials in charge of a Department of Mines in any province or state on this continent, and he is assisted by Dr. W. G. Miller, the Provincial Geologist, one of the ablest mining geologists of the day, a member of the Council of the American Institute of Mining and Metallurgical Engineers and an honorary member and gold medallist of the Institution of Mining and Metallurgy of Great Britain, the only other men from this continent who had received the same medal being the late Dr. James Douglas and E. P. Mathewson.

If the minister takes and follows the advice of these two able men whom he has the good fortune to have in his department he will undoubtedly make a success of his work. I sincerely hope that he will do so, and that he will prove an exception to the rule that a man must know a business if he is to make a success of it. It is not too much to assume that ignorance on the part of a man at the head of a department would prevent him from intelligently criticising, encouraging, or reorganizing the work of that department. Should he interfere he might make trouble for himself and others, and it is not improbable that he would soon decide to leave matters alone in the hands of the permanent officials. Thus he would do his part in helping to establish a bureaucratic government free from criticism or effective control, in which the management of public affairs is released from the hands of the representatives of the people, and is surrendered to the permanent officials who are under the constant temptation of relieving themselves from extra worry by surrounding themselves with an almost impenetrable entanglement of red tape.

The Failure of Bureaucracy

Both in Great Britain and in Canada the stress of conditions during the Great War has shown the weakness and inefficiency of bureaucratic government. The ministers, chosen without regard to special qualifications for their duties, or for any knowledge of the work which they were supposed to supervise, were unable to correct the delinquencies and blunders of their employees. There is no danger of such a lapse into formalism and fossilization in the Department of Mines of Ontario while Messrs. Gibson and Miller are in charge of it, but they will not be there always; others will eventually take their places, and their successors may not be so able and painstaking.

However, our government is new, and has not yet committed itself to any definite line of action. Let us hope that it is without prejudices against anyone engaged or interested in mining. Probably all of its members are men of good common sense, who have the welfare of the country at heart and who are anxious to promote the interests not only of agriculture but of all the other industries on which the growth of the country and the welfare of the people depend.

Importance of Mining Industry of Canada

Mining is, next to agriculture, the most important basic productive industry of the province, and since the beginning of this century it has increased in value and importance much faster even than agriculture itself. If wisely directed it should continue to increase and thrive possibly far beyond the bounds which the most optimistic would now dare to suggest for it. The Premier and his Minister of Mines should shape their policies so that though the miners, like the farmers, will bear their fair share of the burdens of the country, the industry will be assured of an unimpeded growth. In order to accomplish this it is necessary that men with capital, whether in large or small amounts, should be encouraged to invest in sane and honest mining enterprises, and that money so invested should be as safe from confiscatory legislation as money invested in any other business.

Men who invest large amounts are accustomed to protect themselves by obtaining the best technical advice available before parting with their money, but smaller investors have not been trained to look for or to regard such advice, and are consequently easier marks for unscrupulous adventurers. But the capital of these latter investors, even though the individual amounts may be small, may in the aggregate be large, and in any event it is part of the accumulated wealth of the country, intended for use in the development of our natural resources, and one of the duties of the government should be to see that it receives a reasonable measure of protection, and that professional swindlers, who are the legitimate descendants of the thimble-riggers and shell-game men of former days, are not allowed to wheedle it away from its owners without giving them anything of value in return for it.

Necessity of Protecting the Small Investor

It is also necessary, in order properly to insure the growth and welfare of the industry, and to assist investors, especially the small one, in obtaining fair opportunities for reasonable returns from their ventures, that everything possible should be done to arrange that all mines and mining enterprises of any kind in which money obtained in any way by public subscription is invested, or which are owned by companies selling stock to the public, should be put in charge of men who have special knowledge, or have had a special and adequate training and who will therefore be prepared and able to manage them or to direct their development with the probability of success.

A man who wishes to become a lawyer must undergo a long apprenticeship and pass a series of examinations before he will be permitted to handle even the small financial affairs of his fellow citizens, but anyone, no matter how incompetent, untrained, or reckless, is, in Ontario, allowed to manage or mismanage a mine, to handle or disburse large sums of money intrusted to him by confiding people for purposes of development or equipment, and, by bad management, to risk the ruin of what might have been, under proper management, an excellent property, productive of wealth both to its owners and to the people of the country at large. No country with an enlightened government should continue to permit its capital, and especially its irreplace-

able mineral resources, which are the natural heritage of its people, to be wasted or destroyed through ignorance or wanton neglect.

Finally, and perhaps most important of all at this critical time, miners and laborers should be encouraged to work in the mines, just as agricultural laborers are encouraged to work on the farms. Mineral production cannot be sustained or increased without miners, but in Ontario any form of encouragement for them, except that offered by the mine owners, has been conspicuously absent. If, as in the past, men continue to be discouraged from working in our mines, and if a spirit of discontent is fostered among the miners themselves, the mining industry must inevitably suffer, and the general prosperity of the country must decline with it.

After ore has been discovered, capital, knowledge, and labor are required to raise and prepare the finished product for the market. The government, if it is so inclined, can assist in all stages of the work. It has helped all branches of the farming industry; let it now begin to encourage and help the mining industry.

Liquid Oxygen as an Explosive

BY ALBERT G. WOLF

Written exclusively for the *Engineering and Mining Journal*

FOR many years it has been known that liquid air or liquid oxygen mixed with some highly carbonaceous substance makes a powerful explosive when detonated. During the war some experimental work was done in America along this line, but, owing to the difficulty in handling, in part, and largely to insufficient pressure by "Mother Necessity," no great measure of success was attained, and the method was dropped as being of no commercial or practical value. In Germany, however, conditions were entirely different. There, according to the publications of the German Oxhydric Joint Stock Co., the method was brought to a fairly high degree of perfection.

The liquid oxygen, or, as used, a liquid consisting of 98 per cent oxygen, is made from air. The air is first washed free from carbon dioxide. Then it is liquefied by the expansion process, multi-stage compressors and ammonia refrigerating machines being used. After making the liquid air, the oxygen content is raised by taking advantage of the lower boiling point of liquid nitrogen. The liquid nitrogen, evaporating first, leaves a higher percentage of oxygen in the liquid residue, and by carrying out this step in a specially designed apparatus in which advantage can be taken of the extremely low temperature created by the evaporation of the liquid nitrogen, a fairly high degree of efficiency is obtained.

In order to form an explosive mixture, a highly carbonaceous material with the power of absorbing liquid is necessary in addition to the liquid oxygen. This material should preferably be shaped in the form of dynamite sticks for convenience in handling and loading. It is claimed that best results are obtained from cartridges made of cork charcoal and a binder of paraffin. The binder may also be any one of the lighter petroleum products. Kieselguhr (diatomaceous earth) with a binder of paraffin may also be used. In that case the paraffin alone furnishes the carbon, and the explosive is not as powerful as when the charcoal cartridge is used. A good ratio is said to be 60 parts of kieselguhr to 40 parts of binder.

In using this explosive, the liquid oxygen must be carried to the working place in tightly closed thermos bottles, in order to avoid loss by evaporation. The liquid oxygen is then poured out into double-walled vessels, and the cartridges are placed in the liquid to soak. The cartridges must be capable of absorbing sufficient excess of oxygen to insure the presence at the time of detonating of enough to burn all the carbon to carbon dioxide and all the hydrogen to water. Otherwise the deadly carbon monoxide gas will be formed on exploding the charge.

The cartridges are saturated when they sink. They are then hastily removed from the bath, placed in the drill holes, fitted with electric blasting caps, tamping placed before them, and exploded. Not much time must elapse between the removal of the cartridges from the bath and the detonation, the permissible time varying from three to fifteen minutes, depending on the nature and size of the cartridge, because of the rapid evaporation of the liquid oxygen. For this same reason the diameter of the cartridge should not be less than 30 mm. The drill holes should be slightly larger to allow the oxygen vapor to escape while loading, otherwise the cartridges might be prematurely pushed out of the hole.

Though electric firing gives the best results, it is possible to use fuse and cap, or fuse alone. With the fuse, however, there is the danger of prematurely igniting the oxygen vapor and of getting an incomplete combustion. Fuse, of course, should not be used where there is the possibility of fire damp being present.

Experiments have shown, according to the claims of German manufacturers, that to get the same force of explosion, the relative weights of various explosives must be used:

Cork charcoal, paraffin and liquid oxygen	58
Kieselguhr, paraffin and liquid oxygen	115
Blasting gelatin	86.2

The advantages claimed for this method of blasting are primarily economy, safety, and greater strength of explosion. Economy is claimed because each mine can operate its own little liquid oxygen plant for not much more than the cost of operating a compressor plant, making it necessary to buy only the cartridges of carbon. There is safety in handling and storage because the separate ingredients are not explosive. There is absolutely no danger from misfires, because in fifteen to thirty minutes all the liquid oxygen in a drill hole evaporates; and, it is claimed, with the lower-strength cartridges, there is no danger of igniting fire damp. There are also the advantages that low temperature has no effect on the explosive, and, where proper precautions are observed, no poisonous gases are formed.

To the average mine operator or miner, the disadvantages of this method far outweigh the advantages. There is the trouble of carrying the liquid oxygen containers and immersion vessels, in addition to the cartridges, to and from the working faces, the loss of a good percentage of these vessels and the resulting cost, the loss of a large percentage of the liquid oxygen, and the operation of the liquid-oxygen plant. Then there is the danger from hasty and improper immersion, with its resulting loss in efficiency of the explosive and the formation of poisonous gas in the mine. In large stopes, the complications that would arise would be almost insurmountable.

Gold Mining in California

The Gold-Dredging Industry Is Declining—Drift, Placer, and Hydraulic Mining Produce a Small Amount of the Precious Metal—Future Production Dependent Upon Deep Lode Mining

BY GEORGE J. YOUNG

THE industry of gold mining in California represents a systematic development over a period of seventy years, beginning in 1849. There have been ups and downs, but the production of gold has continued in an unbroken stream, increasing at times in volume, at other periods decreasing. It is a stable industry, employing 6,977 lode and 2,212 placer miners in 1916, and 4,800 and 1,500, respectively, in 1917, according to Edwin Higgins.[1] The Great War, beginning in 1914 and ending Nov. 11, 1918, brought about a change which seriously affected the industry, and from which it may take several years to reach more favorable conditions than now exist.

In the latter part of 1917, a discussion arose on the subject, "Is Gold Mining Necessary During the War?" The preponderance of opinion was affirmative, and there followed a period of general interest in gold mining. The result of the discussion and reawakening of interest took definite form in a report of a committee appointed by Secretary Lane to investigate the gold-mining situation in the United States. The report of this committee has been published as a bulletin (No. 144) of the U. S. Bureau of Mines. In it the principal causes for the decline of gold mining are given as "the shortage of labor and higher wages due to the war, the lower efficiency of available labor, the great increase in the cost of supplies, and the higher cost of power. In addition, the depletion of certain deposits and the lower grade of ore mined in others have contributed to the reduction of output."

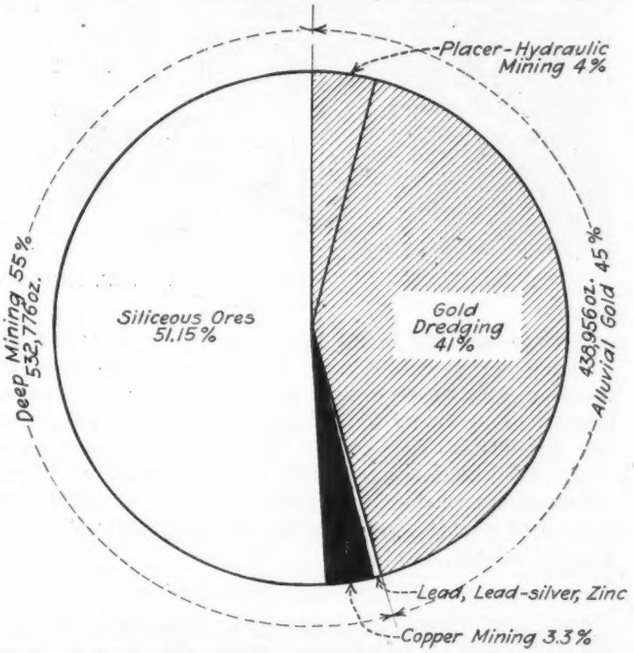


FIG. 1—RELATIVE IMPORTANCE OF PRIMARY GOLD PRODUCTION IN CALIFORNIA IN 1917

[1]*Bull.* 144, U. S. Bureau of Mines, p. 59.

The gold production of California was valued at $20,087,504 in 1917, and in 1918 at $16,490,586. To visualize conditions I will take the year 1917 and present an analysis drawn from the statistical data available for that year. In 1917 there were, according to Charles G. Yale, of the U. S. Geological Survey, 490 mining companies reporting production. Of these, 241 were deep or lode mines and 249 placers. Of the lode mines, there were 145 gold, 48 copper, 3 silver, 24 silver-lead, 19 lead, and 2 zinc mines; of the placers, 71 hydraulic, 55 dredging, 53 drift, and 70 sluicing mines.

TABLE I. COMPARATIVE GOLD PRODUCTION AND ORE TONNAGE, CALIFORNIA, 1917, 1918 (*a*)

Counties	1917 Gold, Oz.	1917 Primary Ore, Tons	1918 Gold, Oz.	1918 Primary Ore, Tons
El Dorado, Amador, Calaveras, Tuolumne and Mariposa	267,095	1,426,665	230,050	1,067,869
Plumas, Sierra, Nevada, Placer	226,829	594,172	197,739	718,279
Kern, San Bernardino	7,414	156,932	13,292	176,666
Shasta, Trinity, Siskiyou	82,364	509,123	62,044	525,942
Mono, Inyo	16,177	102,444	6,361	46,541
Butte, Yuba, Sacramento	215,390	349	293,959	404
Totals 19 counties	815,269	2,789,485	803,445	2,535,801

(*a*) From data given in *Mineral Resources*, Part I, 1917, U. S. Geological Survey, and advance report for 1918.

The distribution of gold production is graphically shown in Fig. 1. From this figure it will be seen that the lode production was 55 per cent of the total, divided into 51.15 per cent from siliceous ores, 3.3 from copper ores, and 0.55 from lead and other ores. The placer gold was 45 per cent of the total, 41 per cent was recovered from dredges and 4 per cent from drift, hydraulic, and placer mines. The geographic distribution of production is given in Table I. This table also includes a tonnage summary.

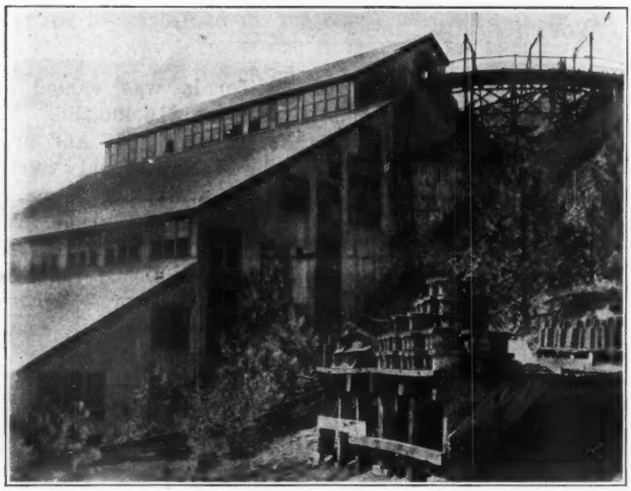
TABLE II. TONNAGE AND VALUE OF CALIFORNIA ORES IN 1917 (*a*)

	Tons	Average Value per Ton in Gold and Silver	Average Value per Ton in All Metals	Ratios Gold and Silver Value to Other Metals
Siliceous ore	2,018,003	$5.133	$5.143	1 to 0.002
Copper ore	892,579	1.565	16.661	1 to 10
Lead	28,080	4.937	40.235	1 to 7.1
Silver	454	13.320	18.239	1 to 0.16
Silver-lead	63,999	8.621	34.186	1 to 2.9
Zinc	135	0.172	88.230	1 to 5.17
Totals	3,003,250	4.146	9.519	

Ratio gold to silver by weight 93.5 gold to 1 silver; in siliceous ores concentrates average by weight 3.8 per cent of siliceous ores milled.
(*a*) Condensed from table p. 206, Part I, *Mineral Resources*, 1917, U. S. Geological Survey.

The Mother Lode (El Dorado, Amador, Calaveras, Tuolumne, and Mariposa counties) was the most important gold-producing unit. The second group comprises Plumas, Sierra, Nevada, and Placer counties. The third group in importance is the gold-dredging area, Butte, Yuba, and Sacramento counties. The fourth group, Shasta, Trinity, and Siskiyou counties, in the northern part of the state, contributes its principal gold output from hydraulic and dredging properties. The gold-mining industry centers in these four geographical units. A less important production is made in copper, lead, and lead-silver mines. Gold production from lode mines is centered in the first two groups; placer production in the fourth and last groups.

In Table II I have summarized the tonnage of different kinds of ores, the gold and silver value per ton, the value per ton in all metals, and the ratio of gold and silver value to the value of other metals. The preponderance of lode gold came from siliceous gold ores of moderate grade. In other kinds of ores there was gold, but in relatively small amount. The gold



NORTH STAR MILL, GRASS VALLEY, CALIFORNIA

production of the state, if it is to continue, must come from two principal sources, deep gold mines and placers. In the production of other metals the accompanying gold output will be small, in fact almost negligible.

All Other Methods Supplementary to Amalgamation

Table III is a summary of 1917 production in relation to the particular method of ore treatment used. Of the lode gold, 76.2 per cent was won by amalgamation and 17.2 per cent from the treatment of auriferous concentrates at smelters. Of the accompanying silver, 37.3

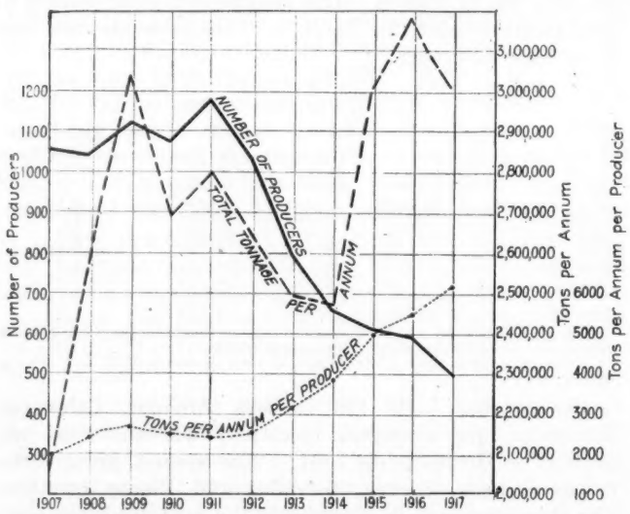
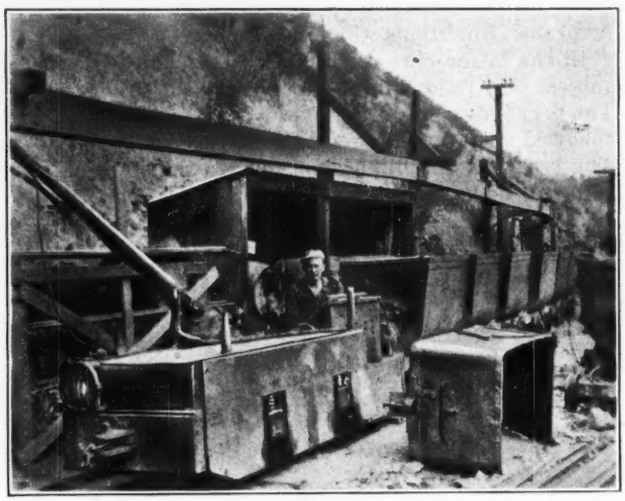

Number of Producers
Tons per Annum
Tons per Annum per Producer
NUMBER OF PRODUCERS
TOTAL TONNAGE PER ANNUM
TONS PER ANNUM PER PRODUCER
1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917

FIG. 2—NUMBER OF PRODUCERS, ANNUAL TONNAGES, AND TONS PER ANNUM PER PRODUCER, CALIFORNIA GOLD MINES 1907 TO 1917

per cent was won by amalgamation and 49.4 per cent from the concentrates treated at smelters. The proportions won by the cyanide process were 4.5 per cent of the gold and 13.4 per cent of the silver. All of the gold won in placer and dredging operations was recovered by amalgamation in part and in part from riffles. The importance of amalgamation in the gold-mining industry is forcibly indicated. All other methods, viewed broadly, are only supplementary. Chlorination as a method for the treatment of concentrates has become practically obsolete, leaving but two other alternatives, the treatment of the concentrates at the mill by cyanidation or shipment of them to smelters.

The relation of the industry to other years is shown in Fig. 2. In the figure, the total tonnage of all ores, the number of producers, and the tons of ore per producer per annum are graphically indicated, beginning with 1907 and ending in 1917. During this eleven-year period there was a large fluctuation in tonnages and a noticeable shrinkage in producers, with, however, a constantly growing production per individual producer. The peak of tonnage production occurred in 1916. The chief tonnage production comes from comparatively few large mines, and, as a consequence, the maximum tons per producer per annum, 6,000, which occurs in 1917, inadequately represents this factor. This curve indicates in a general way the fact that combinations of



ELECTRICAL HAULAGE, MOUNTAIN KING MINE, MERCED COUNTY, CALIFORNIA

several mines are being made, resulting in a greater tonnage per producer than formerly. In the development of an industry such as this, larger and larger operations, growing out of the coalescing of neighboring properties, are to be expected. The economies effected by such combinations are the result of better management, larger and more centrally situated ore-treatment plants, and a better arrangement of facilities for operation.

Conditions in 1918

The year 1918 was a period of difficulties for the gold industry of California. There was a falling off in production of about 20 per cent from the previous year. Operating costs in lode mining increased about 30 per cent, and dredging costs increased 20 to 25 per cent. A scarcity of water hampered dredging operations owing to a curtailment in available power for a part of the year. Costs were increased also, on account of reduction in tonnage. A reduced amount of expenditure for development, on the other hand, decreased the apparent operating cost to a slight degree. In Table IV the geographic distribution and production of gold for 1917 and 1918, together with the tonnage of primary ore, are given. Surprising to note, the number of producers of all kinds increased from 490 in 1917

to 692 in 1918, but this was due to an increase in the number of chromite, manganese and tungsten properties rather than to the number of gold producers. Silver, copper, lead, and zinc production were all less than in 1917, and the gold production which was made along with these metals decreased correspondingly.

TABLE III. GOLD AND SILVER PRODUCTION FROM CALIFORNIA ORES, BY DIFFERENT METHODS OF TREATMENT (*a*)

Ore Treatment, 1917

	From Siliceous Ores and Tailings			
	Gold, Oz.	Per Cent	Silver, Oz.	Per Cent
Amalgamation	376,089	76.2	83,142	37.3
Cyanidation	22,649	4.5	29,937	13.4
Chlorination	9,100	1.8	283	0.1
Concentrates to smelter	85,284	17.2	110,705	49.4
Totals	493,122	....	224,069	....

(*a*) From Part I, *Mineral Resources*, 1917, U. S. Geological Survey.

A pronounced labor shortage developed. This was caused by the induction of men into the military service and by the voluntary transfer of labor to other industries, on account, in many instances, of more attractive wages or conditions. The development of chromite, tungsten, and manganese mining attracted both prospectors and miners from the established industry. The shipbuilding industry on the Pacific Coast drew its quota. Agricultural activity was a minor factor in depleting the labor supply. Necessarily, the reflex of the times was a lowering in efficiency of labor.

Operating Difficulties During the War

There was much difficulty in obtaining normal supplies. Freight rates increased, and deliveries of machinery and supplies were slow and unsatisfactory. The scrap heaps at mines were culled over, and repairs were made from used parts. Only by persistent economy were some of the mines able to operate. Naturally, a depletion of reserves followed cessation of development work. Ore extraction was limited to the richest and most easily mined ore. This is indicated to some degree by the figures presented in Table V, which shows the average value per ton of the ores produced in the Mother Lode counties for the years 1911 to 1918, inclusive. The table does not do justice to the situation, for at some mines only part of the milling facilities were used and only ore of the best grade was mined. The net result was to leave a large tonnage of lean ore in place.

At the end of the year the properties which had been operating on a narrow margin were compelled to face the alternative of continuing operation under increasing difficulties or shutting down. Some properties, such as the Melones and the Yellow Aster, did shut down. The condition of others, with curtailed development and reserves of lean ores, was, needless to say, bad.

Conditions in 1919

Conditions did not improve over those existing in 1918 until the later part of 1919. The shipbuilding strike in the coast region released a sufficient amount of labor to enable properties to resume with an approach to full working forces. There was a heavy labor turnover during the greater part of the year. Labor efficiency was low until the beginning of October, when an improvement began. Cost of supplies showed a recession from the high prices prevailing in 1918.

TABLE IV. GEOGRAPHICAL DISTRIBUTION OF GOLD PRODUCTION AND ORE TONNAGE IN CALIFORNIA FOR 1917 (*a*)

	Gold, Fine Oz., 1917						Tonnage, 1917				
		Deep Mines									
	Placers	Siliceous Ores	Copper Ores	Lead	Silver	Silver Lead	Ore to Gold and Silver Mill, Tons	Ore to Concent. Mills, Tons	Concent. Produced, Tons	Crude Ore to Smelter, Tons	Old Tailings Treated, Tons
El Dorado	926	270	.....	...	....	.....	2,506	.....	66	.....	.....
Amador	297	176,956	.....	...	....	.....	798,952	.....	18,456	23	5,900
Calaveras	25,037	42,923	3,220	...	....	.....	352,641	148,690	26,299	40,503	54,990
Tuolumne	445	15,086	.....	...	....	.....	41,256	.....	1,585	218	53
Mariposa	64	15,091	.....	...	....	.....	41,548	.....	711	328	.....
Totals	26,769	240,326	3,220	...	....	.....	1,236,903	148,690	47,117	41,072	60,943
Plumas	2,574	2,514	1,294	...	....	.....	13,870	172,306	12,409	3,797	.....
Sierra	2,957	15,638	.....	...	....	.....	49,779	.....	1	170	93
Nevada	791	177,370	.....	...	....	.....	337,596	.....	1,096	.....	143,273
Placer	20,240	4,745	1,073	...	....	.....	14,080	.....	117	2,574	.....
Totals	26,562	200,267	2,367	...	....	.....	415,325	172,306	13,623	6,541	143,366
Kern	48	25,970	.....	...	....	.....	123,140	.....	20	2,509	.....
San Bernardino	43	150	7,244	...	6.97	52	.....	.....	.....	31,283	1,000
Totals	91	26,120	7,244	...	6.97	52	123,140	.....	20	33,792	1,000
Shasta	14,054	5,187	18,254	...	....	.....	864	101,173	13,391	392,432	.....
Trinity	28,115	142	865	...	....	.....	186	.....	8	8,615	.....
Siskiyou	14,661	836	250	...	....	.....	2,737	.....	2	3,616	.....
Totals	56,830	6,165	19,369	...	....	.....	3,287	101,173	13,401	404,663	.....
Inyo	.....	1,315	16	123	....	4,611	9,709	.....	201	74,645	.....
Mono	.....	10,112	.....	...	....	.....	18,090	.....	.....	.....	686
Totals	.....	11,427	16	123	....	4,611	27,799	.....	201	74,645	686
Butte	44,389	225	.....	...	....	.....	140	.....	.....	209	.....
Yuba	177,907	.....	.....	...	....	.....	.....	.....	.....	.....	.....
Sacramento	92,799	60	.....	...	....	.....	.....	.....	.....	.....	.....
Totals	215,105	285	.....	...	....	.....	140	.....	.....	209	.....

(*a*) Compiled from statistical tables, *Mineral Resources*, 1917, Part I, pp. 203-252, U. S. Geological Survey.

TABLE V. GRADE OF GOLD ORE MINED IN MOTHER LODE COUNTIES OF CALIFORNIA (*a*)

	Tons	Value	Value per Ton
1918	1,067,869	$4,755,136	$4.42
1917	1,236,903	5,130,682	4.15
1916	1,393,788	5,853,618	4.20
1915	1,521,847	6,349,772	4.17
1914	1,243,529	5,075,522	4.08
1913	1,242,343	4,728,450	3.81
1912	1,299,988	4,803,935	3.69
1911	1,377,084	4,910,358	3.57

(*a*) From data given in *Mineral Resources*, Part I, 1917, U. S. Geological Survey

Active resumption of development to replace reserves depleted during past years has taken place generally in all the mining districts. On the whole, there was a pronounced water shortage during the year, and this had its effect in curtailing power and reducing the operations of the hydraulic miners.

The advance in mining costs, which was general in all the California mines during the war, is specifically shown by the following comparisons for the years 1916, 1917, 1918, and part of 1919 at the Plymouth Consolidated Gold Mines, Ltd. This is a well-managed Mother Lode mine, and the figures are to a certain extent representative of the larger mines.

OPERATING COSTS OF PLYMOUTH CONSOLIDATED GOLD MINES, LTD.

	Jan. 1 to Sept. 30, 1919	1918	1917	1916
Ore extraction	$2.354	$2.256	$1.850	$1.541
Development	.795	.512	.678	.850
Ore treatment	.579	.477	.379	.325
Marketing	.285	.282	.250	.244
General expense	.379	.335	.299	.248
Totals	$4.392	$3.862	$3.456	$3.308

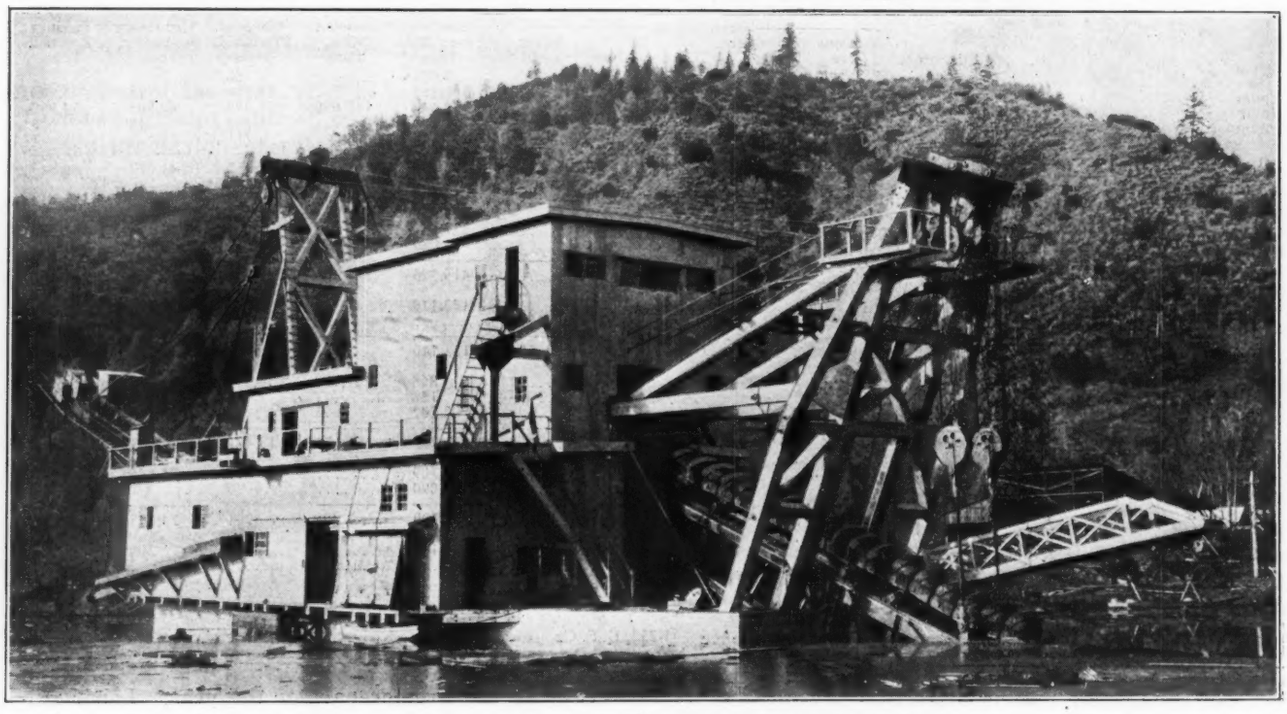
Cost of Supplies in 1919

Explosives cost less in 1919 than in the previous year —40 per cent gelatine dynamite was $22.25 on July 29, 1918; on Dec. 13, 1918, $20.25, and on June 24, 1919, $18.25, the present price per 100 lb. The percentage drop from the prevailing price in the latter part of 1918 is 18 per cent. Both caps and fuse reached over into 1919, and there appears to be no immediate prospect of more than nominal reduction. Rigid economy in the use of supplies is imperative and is being practiced by most companies.

In the dredging field, there was a slight reduction in the price of steel. Manganese steel was reduced 10 per cent. On belting there was no material decrease; on grease and lubricants there was a slight increase. A comparative statement of costs of dredging supplies is given in the accompanying table:

INCREASED COST OF DREDGE MATERIALS, 1916–1918

	Sept. 1, 1916, Per 100 Lb.	Sept. 1, 1918, Per 100 Lb.	Percentage Increase
Plate steel	$4.04	$5.54	37.1
Round soft steel	3.03	5.18	71.0
Soft bar steel	2.20	4.46	102.7
Octagon tool steel	10.00	14.00	40.0
Cast steel 1,001 to 3,000 lb	5.80	16.50	184.5
Cast steel 25 to 50 lb	10.00	26.00	160.0
Manganese steel buckets, foundry price	11.85	20.90	76.4
Lips for same	14.70	23.75	61.6
Nickel chrome bucket pins	9.00	19.20	113.3
	Per Ft.	Per Ft.	
Rubber conveyor belts, 42 in	6.03	8.98	48.9
Wire rope, 1 in., 6/25 P.F.S. Hercules,	.302	.471	56.0
Wire rope, 1 in. 6/19 C.C	.155	.286	84.5
Complete manganese steel 18 cu.ft. bucket as charged to dredges	$493.25	$1,089.19	120.8



VALDOR DREDGE, TRINITY COUNTY, CALIFORNIA

maximum prices in 1918, but have since decreased. Mine timber sold for $25 per M. early in 1919, but late in the year it advanced to $35 per M. Mine timbers under normal conditions in the Mother Lode mines cost $18 to $20 per M.

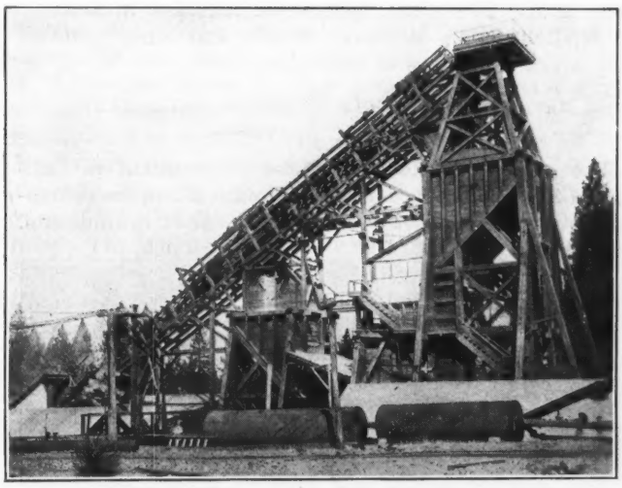
Solid drill steel has not changed in price for two years. Hollow drill steel, ⅞ in. hexagon, has decreased from 26 to 23c. per lb. in small lots (500 lb. or less). Steel shoes and dies, on the other hand, have dropped from the high price of 14c. in 1918 to 6.5c. per lb., the present price.

Most supplies are as high as average prices in 1918. Mining machinery has advanced, if anything. Supplies involving any considerable amount of labor in their production will not, in all probability, decrease in price. The high prices reached in 1918 in general continued

In both the lode mining and the dredging fields the cost of supplies in 1919 is not much less than in 1918 and the much-hoped-for reductions have touched only a few things.

Power costs have increased along with other operating expenses. In 1918 a surcharge of 0.2c. per kw.-hr. was placed on all power purchased from public-service power companies. This surcharge directly affected a large number of dredging and mining properties. The Pacific Gas & Electric Co.'s power charge for all dredging operations is 75c. per kw.-hr., with a minimum charge of $1 per horsepower. This charge is made on the basis of a contract to run as long as the property in question is worked for dredging purposes. The surcharge is an increase of 26 per cent. The power schedule for the Mother Lode counties is as follows:

For installations where the capacity of the consumer's electrical apparatus does not exceed 100 hp., $0.0092 per kw.-hr. (being the equivalent of $5 per horsepower month); for capacity exceeding 100 hp., $0.00826 per kw.-hr. (being the equivalent of $4.50 per horsepower month). A minimum charge of $1 per horsepower of rated capacity of consumer's electrical apparatus is made.



EMPIRE MINE, GRASS VALLEY, CALIFORNIA

The direct increase due to the surcharge is 21.7 and 24.2 per cent for the respective rates. Power costs at the mines showed greater increases than these percentages would indicate. As compared with 1918 or the period before the operation of the surcharge, power costs averaged about 35 per cent higher, and in some cases reached 45 per cent.

Labor Situation Unsatisfactory

The labor situation in mining was not especially good during the greater part of 1919, but tended to improve in the late fall. Except for the Grass Valley strike, in June, which affected 1,000 men for two weeks, other labor disturbances were of a minor nature. On the Mother Lode, wages are $4 for miners and $3.50 for muckers. Some form of bonus is paid by different mining companies. It is usually dependent upon length of service. At Bully Hill, miners are paid $4 to $4.50 and muckers $3.50 to $4 per day. In one dredging district winchmen are paid $5 and oilers $4 on the basis of an eight-hour shift. A bonus of 12½ per cent is paid to the worker after two months of service. On the whole, dredging companies experienced less trouble with labor than the mines, although inexperienced men and scarcity of competent labor were factors which reduced yardage per hour. Repair crews were difficult to maintain, and one company reports a loss of four hours per week in the normal repair time of eight hours per week per dredge. This was due to inexperienced men.

On the whole, labor efficiency was the same or lower than in 1918 and wages were somewhat higher. One large Mother Lode mine reported current labor efficiency as 75 per cent of normal operation; another reported 80 per cent. The first company also reported a decided improvement in labor efficiency during the month of October. There was a noticeable lack of cooperation on the part of mine labor with the management. This condition is undoubtedly a reflection on the almost universal attitude of indifference on the part of labor, and will probably disappear if it has not already done so to some extent.

Good workmen are hard to get, but even this condition shows some improvement. With a return of greater efficiency, better co-operation, and more elasticity in the labor market, the mining companies will be in a better position to reduce their operating costs, even though supply costs do not materially decrease.

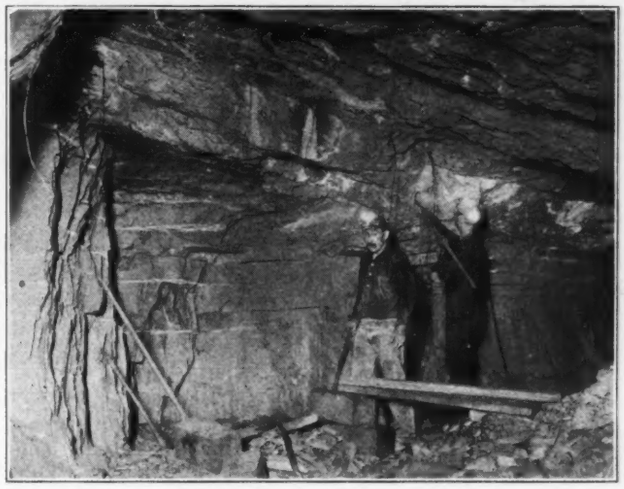
Taxes

Local and state taxes have increased, and in some cases assessments have been raised. Many lode mines, under the prodding of the California Débris Commission and the Fish and Game Commission, have been compelled to construct tailings dams. The expense is not inconsiderable, and it is the expressed hope of the mining companies which are under the necessity of erecting such dams that a reasonable time will be granted them in which to comply with the requirements.

Dredging

According to *Mineral Resources* there were 55 dredges operating in California in 1917; in 1918 the number had been reduced to 47, and in 1919, according to a recent estimate, only 43 dredges were in operation. Of these, three are in Butte County, four in Calaveras, twelve in Sacramento, twelve in Yuba, one dredge was in Placer, one in Stanislaus, four dredges were in Shasta, three in Siskiyou, and three in Trinity County. This gives a total of ten dredges in the northern counties, twenty-four in the Yuba and Sacramento fields, and the rest scattered in different counties.

The dredging industry as a whole is declining. This is due to the fact that most of the available dredging ground is being worked or has been worked out. Whatever new ground is discovered will hardly compensate



MINING A FLAT VEIN, MOUNTAIN KING MINE, MERCED COUNTY, CALIFORNIA

for that which is now being worked. The gold output for 1919 from dredging will be slightly less than for 1918, and with the succeeding years it will slowly decline. The larger companies will probably handle as large a yardage this year as in 1918 and produce as much gold, if not more, but the increase will not exceed the decrease caused by the suspension of some companies now conducting dredging operations.

In Bulletin 144 the dredging costs of the Natomas Consolidated Dredging Co. of California were given

as 5.29c. per cu.yd. for six months of 1918, as against 4.62c. for 1917 and 4.45c. for 1914. It is unlikely that dredging costs of this company will be less in 1919. The Valdor Gold Dredging Co., operating in Trinity County, reports costs of 5.01c. per cu.yd. in 1917, 5.89c. in 1918, and about the same as in 1918 for 1919. It can fairly be said that dredging costs for 1919 will be no lower than in 1918, if they reach the figures for that year.

Alluvial Mining

In hydraulic, placer, and drift mining there is little to record. The La Grange hydraulic mine, in Trinity County, has shut down permanently. A few hydraulic properties are in operation in northern counties. In the Feather, Yuba and American river watersheds eleven hydraulic mines are in active operation. In the north Yuba River a small debris dam has been constructed at Bullard's bar, at a cost of $30,000. This will hold 1,000,000 cu.yd. A larger dam to hold 50,000,000 cu.yd. is to be constructed a short distance below this dam by the Pacific Gas & Electric Co. A third dam, higher up the river, and of the same storage capacity as the one soon to be erected by the P. G. & E. Co., is being considered. There will be resumption of hydraulic mining on a moderate scale in the watershed contiguous to these dams. The Brandy City mine, the Grizzly Hill mine, the Indian Hill mine, and others are directly affected. This combination of power and mining interests is a healthy sign, and more activity in hydraulic mining will result, with continued co-operation between the power and mining companies. The power companies are directly concerned, in that the water heads developed by these dams, which are of substantial and permanent construction, become immediately available on the completion of the dam. The construction costs of dams of the character required is too great for the mining companies alone. A combination of mining, power, and irrigation interests would undoubtedly rejuvenate hydraulic mining on a considerable scale. There has been some increase in activity in drift mining. In Placer, Butte, and other counties only a few mines are in operation.

BRANDY CITY HYDRAULIC MINE CLOSE TO YUBA-SIERRA COUNTY LINE, CALIFORNIA

Metallurgy of Gold Presents Relatively Few New Features

The present methods of gold-ore treatment in California are amalgamation, amalgamation and concentration, amalgamation, concentration and cyanidation, table concentration and flotation, and amalgamation, table concentration and flotation. Owing to the almost universal presence of auriferous sulphides, concentration is invariably used in conjunction with amalgamation. Straight amalgamation is practiced only in small operations where ores from shallow depths are handled. In the Grass Valley district, amalgamation, concentration and cyanidation are used. Table concentration and flotation is used at the Eagle-Shawmut, and at the Dutch-Sweeney mines of the Pacific Coast Gold Mines Corporation, a similar procedure, after amalgamation, is followed. Concentrates are treated either by shipment to smelters or by cyanidation at the mills, the choice of methods being determined by comparative costs and recoveries.

There is increased activity in mining in the Mother Lode region. The Argonaut fire interfered with the operation of this mine as well as with the Kennedy during April, but since then operations have steadily proceeded. The Plymouth Consolidated, Bunker Hill, the Kennedy, the Central Eureka, Keystone, and Argonaut, as well as smaller properties, are pushing development and in most instances milling ores. The Morgan mine, at Carson Hill, and the Calaveras mine, near Melones, and the Dutch-Sweeny group, near Quartz, are among the new properties which are being reopened by W. J. Loring, whose success with the Plymouth Consolidated has played no small part in rejuvenating gold mining in the Mother Lode counties. The success of the Carson Hill Gold Mines, Inc., of the W. J. Loring interests, may be judged by the fact that net profits were $75,000 in September and $500,000 since Jan. 1, 1919. The August clean-up was $104,000. The Eagle Shawmut is running at full capacity. Among the properties which were shut down owing to the difficulties of 1918 are the Melones, Easy Bird, Utica, Original Amador, Fremont, Yosemite Syndicate, Santa Ysbel, and the Jumper. Under date of March 15, 1919, there were sixty-three active gold mines in the Mother Lode counties, employing 455 men on the surface and 1,106 underground. The number of employees has increased since then.

Plumas, Sierra, Nevada, Placer

There is a revival of copper mining in Plumas County and of gold mining in Sierra County. The Engels and Walker properties are in operation, and the Walker Consolidated is developing, as are other smaller properties. Nevada City and Grass Valley did not experience adverse labor conditions during the war to so great an extent as the Mother Lode region, but the strike of June interfered with production and flooded lower levels of both the Empire and the North Star. To recover the levels took considerable time, but now both of these properties are steadily operating, and labor difficulties have been settled. The Idaho-Maryland Mines Co. is unwatering the old Idaho Maryland, and it is expected that development of contiguous properties, as well as of the Idaho Maryland, will be pushed as soon as the lower levels are reached and the shaft is repaired. The old Tightner property, at Alleghany, is to be operated. The Norambagua is under development, and the Banner group, Central Banner, and North Banner mines are being reopened by a company known as the Central Consolidated Mines Co. In this group of counties there were 127 active properties (gold, copper and placer) on March 15, 1919, employing 913 surface men and 1,516 men under ground. As in the case of the Mother Lode counties, there has since been an increase in the number of miners over the number given for March.

Shasta, Trinity, Siskiyou

There is little lode gold mining in Shasta County. The principal lode mining is copper. The Afterthought, at Ingot, is now operating. The Hornet mine, of the Mountain Copper Co., is mining high sulphur ore for shipment to sulphuric-acid plants. The Iron Mountain mine is shut down. The Mammoth mine, after shutting down in May, is now developing. The Balaklala is idle. The Reid gold mine, at Old Diggings, which shipped formerly to the Mammoth smelter, is developing. The gold dredges near Redding are in operation. In Trinity County the Globe mine, at Dedrick, is being developed. The Bonanza King mine, out from Carville, is being operated, and in Siskiyou County no gold quartz mine of any size is in operation, and only one hydraulic mine is being worked. Practically all of the gold production in these three counties is from dredging operations.

Kern and San Bernardino, Inyo and Mono

There is a revival in the Randsburg district. The discovery of the Kelly mine, which promises to be the largest silver mine ever discovered in California, stimulated prospectors and miners. The Yellow Aster, which shut down in 1918, is working on a small scale, prospecting and mining pillars.

The Wilshire-Bishop Creek Mining Co. has resumed. The Cerro Gorda is idle, and at the Santa Rosa some leases are operating. There appears to be little activity in this region.

Future of Gold Mining

As indicated in the first part of this article, the two important sources of gold production are the deep gold mines and the dredging properties. The dredging industry is on the decline, and production from this source may be expected to diminish year by year. Not much is to be expected from placers, but there are possibilities of increased production from drift mines. The Tertiary river channels have, as a guess, been only half exhausted. Although there may be greater activity in drift mining, the total gold from this source will probably not be large.

From hydraulic mining there is a promise for a moderate increase of production. It appears, therefore, that future gold production, if it is to be sustained at approximately the present production, must come from the lode mines. In the Mother Lode region the possibilties of deep mining have not been exhausted. The success of the Plymouth and the Carson Hill properties has shaken the intense conservatism which has prevailed there. Improved mechanical equipment and better metallurgical methods, as well as cheap power, are available. Large, well-financed and well-managed companies are necessary to develop the production from this region.

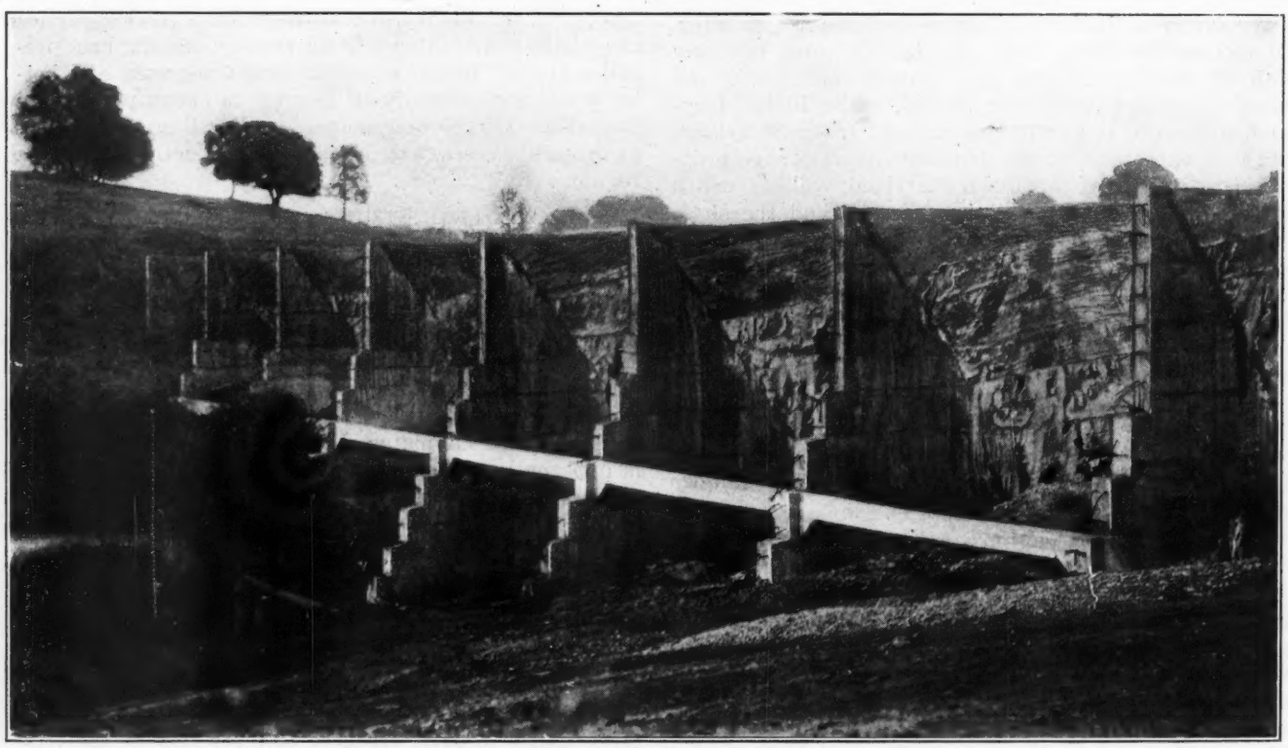
Freedom From Strikes and Increased Labor Efficiency Essential

The initiative of W. J. Loring should be followed by others. With a better spirit of co-operation on the part of labor, increased efficiency over existing uncertain standards is to be expected. Freedom from strikes as well as increased efficiency are vitally necessary for the successful development of the deep gold-mining industry of California. A material decrease in cost of supplies is apparently a long way off, and reduction in mining costs is, therefore, possible only by increased labor output. A closer selection of ore in mining is another factor which will aid in the situation. Sympathetic understanding and co-operation from state and Federal authorities will also help toward building up and sustaining an industry which is highly essential to the prosperity of California.

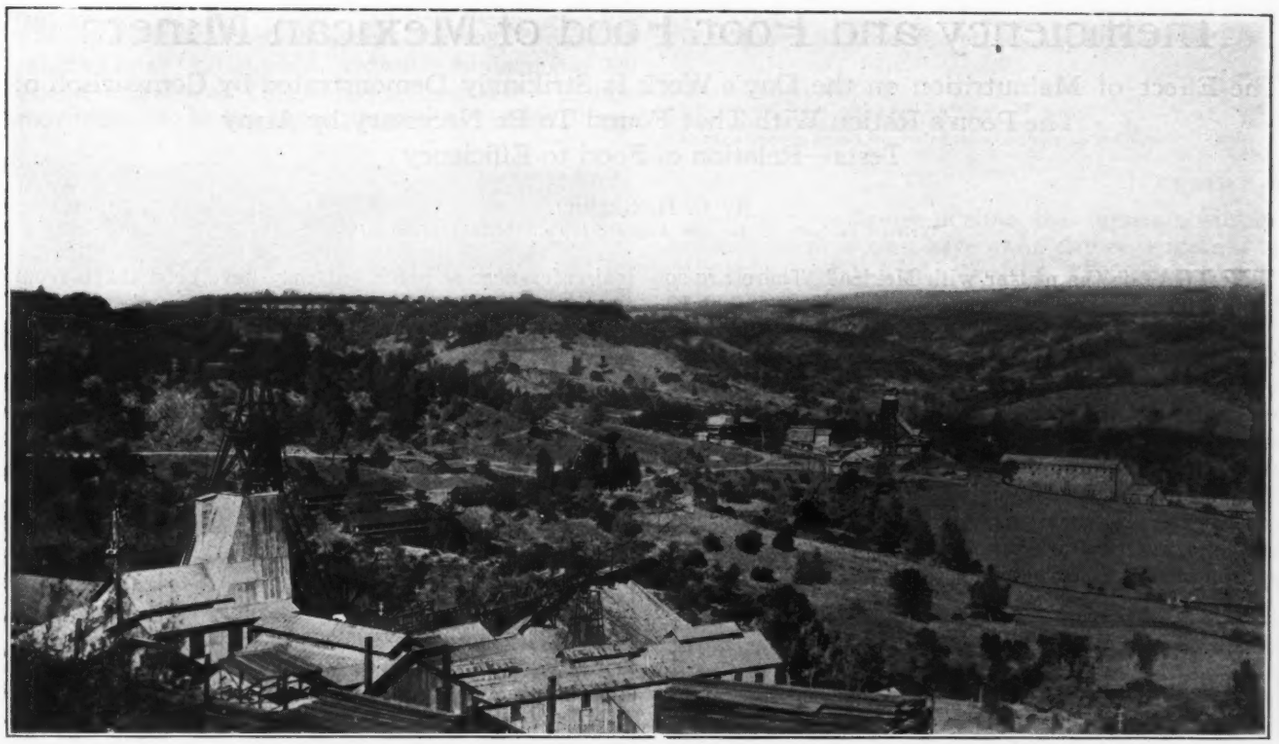
Most of the Silver produced in Canada comes from Ontario, which, in 1919, produced 80.4 per cent of the total production, according to the Department of Mines. British Columbia produced 18.3 per cent, and the remainder, 1.3 per cent, was derived from Quebec, Manitoba, and the Yukon.

Gold Mining in California

ARGONAUT MILL, JACKSON, CAL.
A typical gold-milling plant in the Mother Lode region

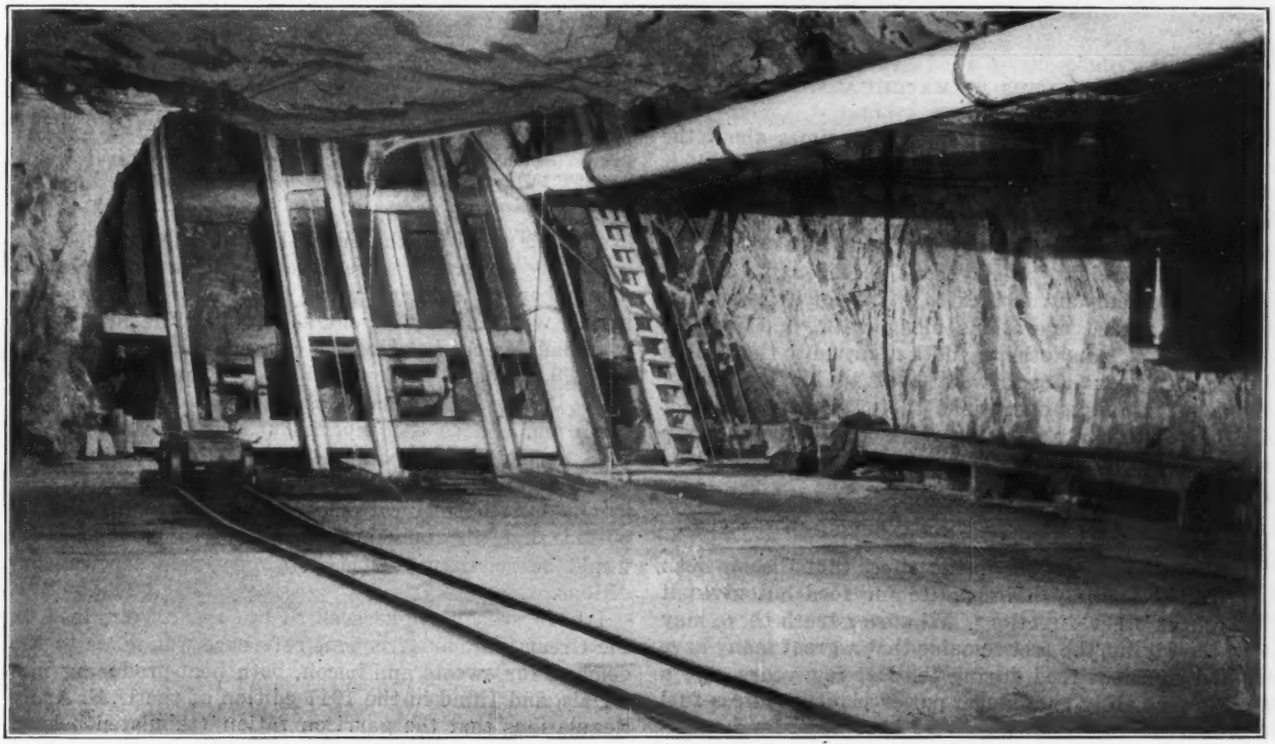


ARGONAUT TAILINGS DAM, JACKSON, CAL.
Under the U. S. Débris Act, stamp mill tailings must be kept out of navigable streams. This obligates mining companies to construct a type of dam which will be acceptable to the U. S. Debris Commission. The constant-angle dam and the buttressed concrete dam, shown in the illustration, are two types installed by the companies.



TYPICAL MOTHER LODE COUNTRY—ARGONAUT MINE IN FOREGROUND; KENNEDY IN THE DISTANCE

The rolling, park-like country so characteristic of the Mother Lode region of California is easily accessible from the great interior valley of the state, and the numerous rivers afford hydro-electric and water power in more than sufficient amount for the industry. The mines are low grade, although occasionally rich pockets of ore and bonanzas of no mean size unexpectedly are found and serve to "sweeten" the returns and stimulate the desire of the miner for fresh discoveries. The region immediately adjacent on the east is timbered and has furnished lumber and mine timber since the inception of the industry. On the whole, conditions are more favorable for low grade mining than in many other mining regions.



UNDERGROUND STATION, KEYSTONE MINING AND MILLING CO., AMADOR CITY, CAL.

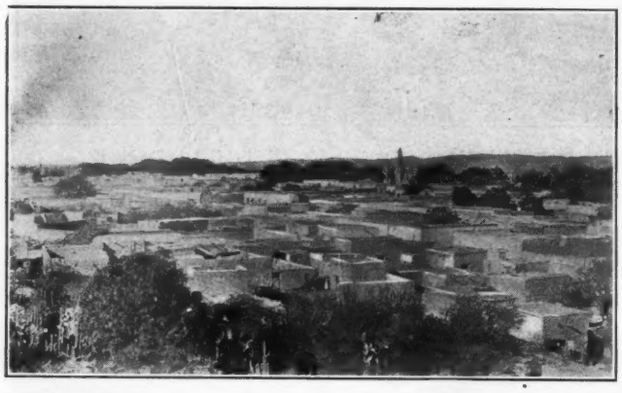
As a rule, shaft and stations in the foot-wall country hold well with either no timber support or only a nominal amount. Drifts in the vein zone and stopes are often in exceedingly heavy ground and require close, heavy timbering. The ingenuity of the timber man is constantly called upon to devise new methods of support to cope with the varying conditions.

Inefficiency and Poor Food of Mexican Miners

The Effect of Malnutrition on the Day's Work Is Strikingly Demonstrated by Comparison of The Peon's Ration With That Found To Be Necessary by Army Tests—Relation of Food to Efficiency

BY C. H. GRABILL
Written exclusively for the *Engineering and Mining Journal*

WHAT is the matter with Mexico? There are so many answers to this question that it might be easier if it were phrased "What is not the matter with Mexico?" but among those published I have seen only one, and that by a Mexican, Albert J. Pani, and which, by the way, is propaganda, and biased, that attempts to give any definite data on the cost of living as it affects the productive efforts of the laborer. This is a phase of considerable importance, not only in a general way as touching political and social conditions, but in a practical way as affecting the cost of labor per ton of ore mined or per acre plowed.



LABORERS' HOUSES AT MATEHUALA, S. L. P.

I have heard a great deal at various times about the inefficiency of Mexican labor and that the man himself is stupid, lazy, and dishonest. I admit that at times Mexican labor is very exasperating, but I believe it to be satisfactory when properly used, and if at times the laborer is inefficient, he may have a reasonable excuse. In 1913 the company in Mexico with which I was connected suspended operations along with, and for the same cause as, many others, and I returned to the United States. A year later I went back to Mexico, and I found on resuming operations that the men were not able to perform a full day's work and that the mere lifting of a tool such as a shovel frequently required a manifest effort.

MEXICAN PEON UNDERNOURISHED

There is an old saying to the effect that the Mexican peon fails to satisfy his appetite for food but gives it free rein in other directions. Whatever truth there may be in the saying, the fact remains that a great many have not had sufficient food during the last few years, and a man, just as truly as a steam power plant, requires fuel in proportion to the work done. I have accordingly compiled a few figures from various sources showing just what these requirements are and to what extent the wage scale permits them to be satisfied.

I have acquired the data from many sources and at odd times and in some cases I no longer have the original references at hand, but they have been taken from standard authorities and have been modified only in a few cases to suit particular conditions with which I am familiar.

The rates of wages differ so widely, and the prices of commodities rise and fall so much, that the natural starting point is the food requirement.

Pope and Carpenter ("Essentials of Dietetics") tabulate the elimination of heat by a man of normal weight (76 kilos) as follows:

	Calories per Hour
During sleep	65
During rest, but awake	100
During light muscular exercise	170
During active muscular exercise	200
During hard muscular exercise	450
During very hard muscular exercise	600

and the practical application:

	Calories per Day
Man at rest in bed	2,000
Man engaged in a sedentary occupation, *e. g.*, a clerk	2,500
Man whose occupation entails moderate muscular labor, as a house painter	3,000
Man whose occupation necessitates hard, muscular labor, *e. g.*, a farm laborer	3,500
Man engaged in strenuous occupation, *e. g.*, a lumberman	5,000
Man engaged in heavy work (Herve-Magnon)	6,000
Women in general about 80 to 90 per cent of men's requirements	
Children from three to nine years	1,200 to 1,500

Some practical results obtained by different experimenters are:

	Calories per Day
Carpenters (German)	3,200
Mechanics (German)	3,100
Metal workers (eight hours)	3,200
Joiners (eight hours)	3,100
Stone workers (eight hours)	4,500
Sawyers (eight hours)	5,200
Truckmen in Massachusetts in winter	8,848
Waitress	2,600
Laundress	3,000

In 1909 and 1910 the medical authorities of the British Army undertook some experiments in this line, and a number of soldiers were tested by a twelve-mile march with full equipment each day. The first series was made on the basis of their standard ration, containing 160 grams of protein and a fuel value of 3,100 calories. It was found that this would not keep the men in condition, and so the experiment was repeated with a ration of 4,100 calories and 180 grams of protein. This, according to the reports, just about met the requirements, but the medical officers conducting the test reported that, in their opinion, 4,500 to 5,000 calories would be required to meet ordinary field service conditions.

I have seen no figures as to the results obtained in the Great War, but frequent reference was made to the demand for sweets and bacon, both heat-producing materials, and I find in the 1917 edition of the U. S. Army Regulations that the garrison ration (tabulated below) contains from 3,200 to about 6,000 calories, with a provision that the commanding general may increase this in field service if conditions require and permit.

The estimate of the protein requirements by different investigators differs greatly, the variation apparently

being due to the character of the protein with which experiment is made, and the occupation of the subject. The figures run from 45 grams per day, frequently referred to as Chittenden's irreducible minimum, to 200 grams. Professor Langworth estimates the protein requirement to be the amount needed to furnish 12 per

TYPICAL HOME OF BETTER CLASS LABORER

cent of the total calories consumed; that is, a man consuming 3,000 calories would need 90 grams of protein. The Life Extension Institute says that from 75 to 110 grams is the correct amount, but its clients are usually from a class doing comparatively little muscular labor. The British Army officers referred to above say that from 120 to 200 grams are needed, and these figures are apparently concurred in by the military authorities of all countries. One authority says that vegetable proteins have only half the value of those of animal origin, and that is of importance in considering the value of corn in the peon's dietary.

As a reminder I quote the values usually assigned to the food elements as ordinarily classified.

	Calories per Gram		Calories per Gram
Protein	4.1	Carbohydrates	4.1
Fats	9.3		

Round figures are sometimes used to allow for incomplete utilization, but the practice is not to be recommended.

These figures are not compiled to show what an inefficient worker requires, but how much the hard-work-

PEON CHILDREN

ing, efficient man needs. A mine mucker and driller, and a man shoveling ore into a charge buggy and wheeling it to a furnace, and the man unloading ore cars or handling freight, are doing hard work. They easily come in the class needing 4,500 calories or more. Their work is certainly as hard as that of lumbermen, stoneworkers, and sawyers referred to in the tables.

Looking at it from the standpoint of the first table:

	Calories
8 hours sleeping at 65	520
4 hours around home, eating and loafing at 100 calories	400
4 hours going to and from work and light exercise at 170	680
8 hours unloading ore and performing other similar work at 450 to 600	3,600 to 4,800
Total	5,200 to 6,400

Bearing these figures in mind, that there are winters, and that the peon must have warm clothes or make it up with extra food, it would seem that 4,500 calories would be a conservative requirement. Now, the peon has a family. There is usually a wife and several children, and perhaps a parent unable to work. The mortality among the children is high, but there are many births. A conservative figure would be to take the family as four, a man, wife and two children, and their requirements would be:

	Calories
Laborer, hard worker	4,500
Woman, at home, cooks, looks after children and performs household duties	2,600
Children, five and nine years old	2,700
Total	9,800

As a means of satisfying these demands the U. S. Army ration, previously mentioned, is a well-balanced allowance of simple substantial food and may be taken for comparative purposes. It has a heat value of 4,632 calories, as given, which is little more than the requirements assumed for the man, and may be increased proportionately for the other members of the family. Table I gives this ration, and I have calculated the heat value and the cost in Mexican currency from the prices and units quoted. The prices used are taken, as far as possible, from the *Monitor Comercial* of Mexico City, dated Oct. 4, 1919. They are those of the large retailer or small jobber and are taken to represent average conditions, but are less than the prices actually paid at retail by the peon, who buys by the pennyworth.

TABLE I. GARRISON RATION

Substance	Ounces	Calories	Mexican Per Kilo Peso	Currency Cost Peso
Beef: 12 oz. of bacon, 16 oz. of canned meat or fish or 14 oz. of dried fish may be substituted	20.0	1,250	0.60	0.281
Flour: 16 oz. of soft bread or 20 oz. of corn meal may be substituted	18.0	1,845	0.16	0.082
Potatoes: Various vegetables may be substituted for part of the potatoes	20.0	369	0.25	0.142
Beans	2.4	248	0.30	0.020
Prunes	1.28	115	2.00	0.073
Coffee	1.12	....	1.15	0.037
Sugar	3.2	384	0.70	0.064
Evaporated milk	0.5	25	....	0.020
Vinegar (gill)	0.16	....	....	0.005
Salt	0.64	....	....	0.001
Pepper	0.04	....	....	0.001
Cinnamon	0.015	....	....	.....
Lard	0.64	173	2.00	0.036
Butter	0.5	115	3.50	0.050
Syrup (gill)	0.32	108	....	0.010
Lemon extract	0.015	....	....	.....
Totals	....	4,632	....	0.821

Various other substitutions are allowed, with the result that the ration may contain from 3,200 to 6,000 calories. For example, the substitution of corn meal and bacon for the flour would increase the calories to 5,800. The calories are calculated from the tables in Pope and Carpenter, and there is a small allowance for food not absorbed.

Taking the figures as given, the ration costs 82.1 centavos and the total 9,800 calories required would cost at the same rate 1.75 pesos. Now, the actual wages being paid in the districts represented by these prices

were from 1 to 1.25 pesos for peon labor. Higher-grade labor, of course, was paid more, in proportion. Skilled labor was paid at rates varying from 2 pesos for the lower classes in some districts to 25 pesos per day in the Tampico district, where, by the way, prices were also high.

It is obvious, though, that the peon with a wage of 1 peso or a little more cannot afford to pay for this ration, so the next question is what can he do with the money and food available?

The cheapest foods and the ones preferred by the Mexican laborer are tabulated, with their food values, in Table II. Wheat products and fruit and vegetables are omitted because of their cost per calorie.

TABLE II. MEXICAN LABOR RATION

Substance	Protein, per Cent	Fats, per Cent	Carbohydrates per Cent	Calories, per Kilogram
Corn meal	9.2	1.9	75.4	3,645
Lean beef	24.3	2.8	....	1,257
Beans	22.5	1.8	59.6	3,533
Lard	....	100.0	....	9,300
Sugar	....	....	100.0	4,100
Bread	9.4	1.2	54.1	2,725
Rice	8.0	0.3	79.0	3,570
Chile	9.4	7.7	70.0	3,971

No allowance is made for waste or non-utilization by the system.

The cheapest food in the above list is corn, and it is the mainstay of the peon family. It is prepared by soaking in water or a weak lye made from lime, and washing and grinding to a paste, from which thin cakes (tortillas) are made. The treatment with water and lye is said to cause considerable loss of nutritive value, but I have no figures as to the amount. Rubner, as quoted by Lorand, says that in whole-corn bread only one-half the nutritive value is absorbed by the system, but I believe that the treatment given the corn prepares it better, and also the centuries of habit have accustomed the Mexican digestive system to it, so that the figure is probably extreme.

At 3,645 calories per kilo it would require 2.7 kilos to provide the necessary 9,800 calories, and if 10 per cent is allowed for hulls, chaff, and loss in cooking, the peon would need 3 kilos per day.

In October, 1919, the *Monitor Comercial* quoted corn in the various cities throughout the republic at from 9 pesos to 29 pesos per carga of 150 kilograms, that is, about 12c. mean, per kilo, or 15c. Mexican per kilo, as the peon would buy. This is not so bad, but in 1918 I saw corn sell for from 12 centavos to 45 centavos per kilogram, and at the last price it is evident that the peon's pay would not suffice for even sufficient corn for his requirements, because the three kilograms cost 1.35 pesos, or more than his wages if he worked every day in the week, and without any allowance for clothing or other expense.

There are other objections to this straight corn diet. First, there is the danger from pellagra or other disease of that type. Atwater has shown that in purely vegetable diets the unutilized proteins amount to 28.9 per cent, but that the addition of sufficient meat reduces this to 8.8 per cent. Furthermore, a man is not a boiler that can utilize the same kind of fuel indefinitely. Rubner's statement has a base of fact, at least, though I do not believe it applies without some modification to Mexican conditions.

I have, therefore, prepared Table III, giving a ration such as a Mexican laborer, a little above the lowest grade, would select, and I have calculated the food values and the cost at the prices in the *Monitor Comercial* and also at the prices of the market in Matehuala, S. L. P., in the spring of 1918.

TABLE III. ADEQUATE RATION FOR MEXICAN LABOR

Commodity	Grams	Protein	Fats	Carbohydrates	Calories	1919 Price Cost per Kilo, Peso		1918 Price Cost per Kilo, Peso	
Beef	600	145.8	16.8	.....	754.0	0.50	0.30	0.50	0.300
Corn	1,850	153.2	31.6	1,255.4	6,069.1	.15	.277	.30	.554
Beans	300	67.5	5.4	178.8	1,058.0	.30	.09	.45	.135
Sugar	100	.....	.....	100.0	410.0	.70	.07	1.20	.12
Lard	100	.....	100.0	.....	930.0	2.00	.20	2.75	.275
Rice	100	8.0	0.3	79.0	359.4	.50	.05	.60	.06
Chile	50	4.7	3.8	35.0	198.1	1.60	.08	.60	.03
Salt	50	.....	.....	.....	.....	.20	.01	.10	.005
Totals	....	379.2	157.9	1,648.2	9,778.6	....	1.077	....	1.479

With the exception of corn, all the items have been calculated at 100 per cent, with no allowance for waste. Corn was taken at 90 per cent of the full value. The condition is impossible of realization, of course. In this country the butcher weighs the wrapping paper, so in Mexico the dealer weighs the paper in which he sells the pennyworth of lard. There is a little dirt in the beans, and some of the food is burned or lost in cooking, and some is not digested.

PEON JACALS

Referring to Table III it is seen that the ration in 1918 cost 1.48 pesos per day, or, making practical allowances, probably 1.60 pesos per day. The answer is that the peon, under such conditions, was inefficient, lazy, stupid, and, if he had energy enough, probably dishonest if opportunity to get a little food occurred.

At present the ration costs 1.08 pesos, or probably about 1.20 pesos. The ratio between the various elements is not bad, except that the fats are below the proportion considered favorable, and fats constitute the most expensive item.

In addition to the expense for food, the man must pay from 7 to 15 centavos per day for rent, a cent or two for water, and buy a little wood or charcoal for fuel. The wood sells at 6 pesos per ton wholesale. In Mexico City there is a law that every man must wear pants, so there, at least, he must buy or rent a pair. The wife must have a cotton dress once in a while, and cotton sells for 35c. U. S. currency per lb. in New Orleans.

The law says that the man may only work six days in the week. He positively must smoke an occasional cigarette, and once in a while he gets sick, and the children get sick also. Pani says that the death rate in Mexico City is three times that in the United States, and 40 per cent of the deaths are those of children less than five years old. The man must have a hat and a pair of huaraches (which accounts for some of the damaged and missing leather belts), and in winter time a serape.

Formerly corn sold at 3 centavos a kilogram, and meat at 20, and other commodities in proportion, and these figures did not apply, nor do they apply today, to mechanics and skilled labor nor in a few favored localities, but there are many places in which they do apply, and in such cases it is clear that the peon cannot support a family and have sufficient food to enable him to do a full day's work. It is this condition of affairs that has permitted robber bands to recruit their forces with such ridiculous ease.

Responsibilities of Employers

At any rate, the situation is clear and the reason for it also, and if an employer expects to get efficient labor he must see that the laborer is in a physical condition to perform the work, and he must apply the same rules as are indicated to be necessary in any other engineering problem.

In the case considered, 9,800 calories are required for the man and his family, but of these 5,300 are consumed by the family and 2,300 by the man in walking around and being alive, leaving only 2,200 net which he utilizes in work for his employer; that is, the employer pays 1.25 pesos for 2,200 calories of work. If the wage only permits the man's buying 3,400 calories of food for himself, then the employer gets only 1,100 calories of work, and must hire another man at an additional 1.25 pesos per day, and there is a consumption of 19,600 calories to obtain 2,200 calories of work. And the engineer talks about inefficient labor! Inefficient engineering would be more to the point.

The price of a thousand calories of food in the example is approximately 12 centavos. If the man's wage permits him to buy only 3,400 calories, the employer pays 1.25 pesos for 1,100 calories of work. To obtain the second 1,100 with another man, he must pay the additional 1.25 pesos, but if he can increase the first man's food supply 1,100, at a cost of 12 centavos, the same result is obtainable. I am not saying here that the employer will get 100 per cent efficiency, for the law of diminishing returns certainly applies, but he cannot get 1,200 calories of work from 1,100 calories of available food.

Solution of the Problem

Of course, the first answer is to raise the wages. Barring all considerations of the ethics of the case, the answer is not so simple. In the first place, owing to the demoralization of the transportation system, prices fluctuate violently and rapidly. The peon is naturally improvident, and if he has more than his simple needs require for the moment, he quits work, so the result would be that the wage would have to be high enough to cover maximum conditions of prices, and then in succeeding periods of lower prices the man would work only part of the time, and would spend much of his surplus for pulque or mescal; in fact, many would prefer the mescal to additional food. This is fact and not theory, just as it was found to be so on the Indian reservations of the United States. This increases the disinclination to raise wages that many employers feel.

Some companies have attempted to solve the problem by giving a small increase and then arranging to furnish corn and other staples at or at less than cost. Others have retained the old wage schedules and added a fixed amount of corn, beans, and similar supplies, which is the same as paying wages partly in cash and partly in commodities. These methods are compromises, of course, and they also meet with considerable opposition from local merchants, who consider them infringements on their own prerogatives, but the arrangement does prevent extortion. I have seen corn sold at 12½ centavos a kilogram at the company store (cost, as it happened at the time) and at 60 centavos in the market at the same place and time. The difference was mainly profiteering.

Transportation is so bad that I have known corn to sell at 8 centavos in a producing district and at 25 in a mining camp less than a hundred miles distant. Of course, such a state of affairs lasted only a short time, but the peon has no reserve, and suffers accordingly.

I am inclined to believe that it would pay many companies to establish field kitchens and serve meals to their men under suitable conditions. The best plan of all, where possible to utilize it, is some modification of the Dominguez scheme, but it is possible only with strong and firmly established companies, with a long life, and then only under favorable conditions.

The problem warrants much study, and each case must be considered individually.

Insidious German Commercial Warfare To Be Renewed

That Germany is making serious efforts to regain her foreign markets is shown by the tremendous advertising campaign being organized by the "Reichsverband Deutscher Industrieller" (National Association of Industry), in conjunction with the "Verein Deutscher Ingenieure" (Society of German Engineers).

The National Foreign Trade Council has received the information that under the management of the "ALA" (Allgemeine Auzeigen Gesellschaft m.b.H.), a notorious propaganda center of German war industry, foreign countries are to be flooded with German periodicals. An engineering export paper, issued in four languages—German, English, French, and Spanish —will soon make its first appearance. Engineering concerns are subscribing heavily to this enterprise in the form of advertising contracts and prepaid subscriptions for a large foreign circulation during a period of five years. Individual firms, like Krupp's, alone have contracted to pay the fees for over 3,000 free copies to be sent out regularly during that period. Further, a combine or trust of the German industrial press is in the course of formation with a view to making concerted efforts in the same direction.

The "ALA" intends to establish offices in all foreign capitals to act as advertising agencies and as distributing centers and news gatherers for the "Uberseedienst" (Overseas Service), a large German agency for commercial news affiliated with the "ALA." In the former capacity it hopes to wield much influence in the foreign press and trade periodicals.

The Importance of Using Properly Insulated Wire should not be overlooked when installing electric lights underground. Wire of the weatherproof type is not suitably insulated, and should never be installed underground. Weatherproof wire is manufactured for use on the surface, and is for use especially where it is supported by poles some distance from the ground. Wire to be used underground should be protected at least by insulation with a substantial outer braid protecting the insulating compound, which consists of vulcanized rubber.

Airplanes in Mining Operations

Bird's-Eye View Discerns Many Things Not Seen by the Grubber on the Surface—Marshy And Thickly Wooded Areas Effectively Surveyed and Mapped By Means of Aerial Photographs

BY EUGENE SHADE BISBEE
Written exclusively for the *Engineering and Mining Journal*

"A GREAT SAVING in exploration work would be effected if the more promising places could be located from the air, For example, it is now well known that the great porphyry copper deposits of the Southwest exhibit a very deep red color in contrast to the surrounding soil of the average country. It would seem to be a simple thing to pick out such places by airplane reconnoissance."

The remarks quoted were made by Dr. C. P. Berkey, geologist, of Columbia University, to Lieutenant William W. Hosp, test pilot for the Cantilever Aero Co.,

LIEUTENANT WILLIAM W. HOSP

of New York, to whom I am indebted for much of the information contained in this article.

"Experiences of fliers invariably demonstrate," said Lieutenant Hosp to me, "that the entire map laid beneath an aviator is one of varying colors. All perspective is lost after an altitude of several thousand feet is reached, and landmarks are only bits of different color immediately beneath; and at an altitude of four thousand or more feet everything becomes perfectly flat and the colors stand out even more distinctly than at lower levels."

With such a fundamental beginning it is reasonable to consider that the airplane will soon become a decidedly valuable factor in mineral prospecting, for which there are several most vital reasons. In the first place, and for example, assume a territory ten miles square in a country the topography of which makes it practically inaccessible to men and domestic animals and yet where there are presumed to be many valuable mineral deposits. By the hardest of hard work five men, equipped with every device known to science, might explore that territory of one hundred square miles and make a rough map of it in two years. The cost of such an exploration would be, approximately, $60,000, and this only for the preliminary work and at a hazard.

Contrast that work with what an airplane carrying a pilot and an observer could do. In one day the entire territory could be thoroughly covered in a prospective flight. In the first and second weeks photographs of the entire one-hundred-mile square could be made, and within three weeks, at the outside, weather conditions being favorable, mosaic maps and detailed engineers' maps could be at the disposal of the directors of the enterprise. The total cost of this, including the pilots, observers, photographers, mosaic map makers and engineers' map makers, not including the cost of the plane, would be well under $3,000.

The figures quoted are based on salaries far in excess of the average rate paid. As far as the cost of the machine itself is concerned, airplanes may be hired for the purpose, or, if purchased outright, would cost less than $10,000, inclusive of the most elaborate photographic equipment.

Flying high above the territory to be explored, the photographer notes the colors of the areas he snaps on his plates or film, in order to enable the mosaic map maker to detail these on his completed work. Every mining engineer knows that within the zone of active rock weathering the iron compounds are transformed into ferric oxide, or hydrate, if the amount of oxygen is sufficient.

No less an authority than the Air Service of the United States Government says that aërial surveying possesses many distinct advantages over land surveying. An example would be an attempt to make a land survey of marshy ground, thickly wooded tracts or other practically impassable regions. Land work in such circumstances would be almost impossible, or, at best, very difficult, extremely hazardous, and almost prohibitive in cost, on account of the time required. To accomplish the same amount of work it is merely necessary for an airplane to fly swiftly over the area, and, with a camera attachment, make a record so perfect that it could not be duplicated by land survey.

From the photographs taken by means of the airplane the mosaic map would be made, and from that the completed engineers' map. Every detail of the territory is recorded.

Since the signing of the armistice the Government has been developing special apparatus for aërial map making, and the time is immediately at hand when the airplane will be used by the mining man as intimately as the former now uses his "flivver."

CONSULTATION

UNDER THIS CAPTION we will publish from time to time inquiries received from our readers, and our replies, whenever such correspondence is likely to be of sufficient interest to justify its presentation.

Desires Experience in Colombia

"In your number of Dec. 27 I noticed some interesting pictures from Colombia. I am looking for an opportunity to go to Colombia, and I will be obliged if you will kindly give me the name and address of someone with whom I might correspond with a view to obtaining employment in that country."

If you are an engineer, or an experienced miner, or competent to supervise mining or milling operations, we suggest that you get in touch with some substantial organizations engaged in prospecting or operating in Colombia, and learn what opportunities, if any, they have to offer you. You might approach any one of the following: Breitung Mines Corporation of Delaware, 11 Pine St., New York; W. T. Griswold, Colombian Syndicate, care of the Cosmos Club, Washington, D. C.; South American Gold and Platinum Co., 61 Broadway, New York.

Under no circumstances would we advise a young man to go to any South American country to look for a job, because he would probably not be favorably received, but would be looked upon with suspicion as a stranger in a strange country, and as one unable to obtain employment in his own country.

Many American miners and engineers are busy in South American countries, but almost without exception these men were sent there under contract signed in New York or elsewhere in this country prior to taking passage from one of our ports.

If you have sufficient funds to permit you to travel in Colombia for the purpose of seeing the country, or with the intention of prospecting, then we suggest that you take passage for one of the principal ports best suited to your purpose. For example, if you are interested in platinum, it would be wise to go to Cartagena, whence you could obtain passage to Quibdo, which is headquarters for those who desire to visit the platinum regions or gold-dredging districts tributary to the headwaters of the Atrato and San Juan rivers. At Cartagena you should call upon Espriella Hermanos, who have helped many an American traveler by offering valuable suggestions, giving letters of introduction, or instructions regarding routes and trails. The members of this firm speak English, and they have the reputation of rendering valuable assistance to mining men.

If you are interested in quartz mining, or oil, or placer regions not tributary to Cartagena, we suggest that you go to Barranquilla, where you will find Carl Parrish, who is an American mining engineer well informed on the mineral resources of Colombia, and willing to give you such advice and assistance as you may require in selecting a most advantageous route of travel.

Other mining engineers and mining men in Colombia who are in a position to give a traveler valuable information are: W. A. Prichard, Barranquilla; Walter A. Funk, Puerto Andes; William F. Ward, Puerto Andes; W. J. Hayes, Andagoya; N. C. Marshall, Buenaventura; H. G. Granger, Cartagena; and Harvey B. Small, Mangangue, Colombia, or Rocky Mountain Club, 65 W. 44th St., New York, N. Y.

Platinum Quotation

"Kindly cable market price and feeling platinum."

Steady demand at $155 per oz.; jewelers have paid $170.

World's Record for Shaft Sinking

"Wire us night letter our expense world's record for shaft sinking, number of days, footage, where made and by whom."

New world's record claimed at Crown Mines, Johannesburg, South Africa, where circular shaft 20 ft. inside diameter was sunk 279 ft., or from 655 to 934, average speed 9 ft. in 24 hours, during December, 1918.

Previous world's record also held at Crown Mines, where 252 ft. was made in a 31-day month at No. 14 Circular Shaft. R. C. Warriner, 120 Broadway, N. Y., was consulting engineer at Crown Mines up to end of 1918.

Also see the *Engineering and Mining Journal*, March 29, July 12, and Sept. 20, 1919.

Iridium Quotation

"We are interested in aluminum, platinum, palladium, and iridium, and take this opportunity to draw your attention to the fact that though you quote prices on the first three articles named, you do not quote a price on iridium. We know that your quotations will be useful to us, and we believe that there are others who feel the same way."

We desire to render valuable and useful service to our subscribers and readers by quoting regularly any metal, mineral, or non-metallic mineral product in which our friends are interested, and we thank you for the above suggestion. We have made an effort to obtain reliable sources of information which would enable us to quote iridium intelligently. We have found that it is difficult to get the information desired. It appears that the market for iridium is very limited, that the amount of unalloyed iridium metal is small, and most sales seem to be made as a result of individual bargaining. Some of our friends who deal in this metal from time to time believe that a fair quotation might range anywhere from $300 to $325 per oz. However, we believe that the quotation for iridium should be regarded as "nominal," and that no definite figure can be stated with safety or assurance. There is little, if any, of the metal to be had as such, most of the available supply being alloyed with platinum or other metals of the platinum group.

Acting on your suggestion, it is our intention to quote iridium regularly, and present the best information that it is possible for us to obtain regarding its market value.

THE PETROLEUM INDUSTRY

Drilling and Rig-Building Data

BY SETH S. LANGLEY

Written exclusively for the *Engineering and Mining Journal*

DATA on the time and materials required and the cost of drilling oil wells are of great interest to the engineer who must plan such work, but very few detailed figures have been published on the subject. Such data, of course, can be obtained only by experience. It is the purpose of this article to give detailed information on work actually done in California, the examples being taken from the Midway Sunset, Montebello, and various wildcat districts.

The data presented have been selected as being characteristic of standard practice. The Midway Sunset field presents no unusual subsurface conditions. The formations are sand, gravel, and boulders, overlying clay and shale, with occasional hard strata, locally known as "shell," which are seldom more than four or five feet thick. The water conditions are best illustrated by the casing records. Steeply pitching strata of shell cause trouble in the Montebello field. The drilling operations were carried out by contractors or operators, who maintained well-equipped and trained organizations.

The following Tables 1, 2, and 4, show wells drilled by rotary from the surface to the bottom of the lowest water string, and thereafter finished by cable tools. Table 3 shows a well drilled entirely by cable tools. So few wells are drilled in this way that it has been impossible to obtain complete data on more than the one example.

The figures given below are made up from wells drilled under similar conditions. A comparison of the progress between contractor and company drilling is best shown by the relative time required to cement the first string. It is not feasible to contract below the first shut-off, as the contractor's desire for speed and the operator's hope of production cannot both be satisfied.

It has become standard practice in California to use the 84-ft. combination derrick for wells less than 1,500 ft. in depth, but the 106- or 114-ft. combination derrick is better adapted to deeper wells. The following is a working estimate of the cost of each type:

DERRICK COSTS

	84-Ft. Combination Derrick	106- or 114-Ft. Combination Derrick
Rig irons	$1,000	$1,000
Rig lumber	990	1,300
Building derrick	300	460
Casing rack	50	50
Wiring rig	40	40
Foundation	.....	150
Steel crown block	.....	800
Extra lumber for rotary	.....	75
Extras	50	.....
Totals	$2,430	$3,875

The following tabulated estimate is based upon Midway Sunset experience. Attention is drawn to the wide difference in cost of casing and drilling in the two deep wells. Well No. 1 will have one more water string of casing, and, consequently, greater expense in sliming formations and carrying casing. All of these wells will be drilled rotary to the lowest cement shut-off, and finished by cable tools.

	Well No. 1 Depth 3,500 Ft.	Well No. 2 Depth 3,500 Ft.	Well No. 3 Depth 1,050 Ft.
Rig and rig irons	$3,800	$3,800	$2,650
Casing	19,500	14,500	6,000
Hauling	900	900	600
Rigging up	950	950	800
Lines	500	500	200
Drilling	17,500	12,500	1,700
Power	1,000	1,000	400
Repairs to drilling tools	150	150	50
Rental of drilling tools	100	100	50
Cementing	700	600	500
Bringing in	850	750	600
Totals	$45,950	$35,750	$13,550

Table 1 — Wildcat Company Drilling

Number of days to drill and cement first string	22	36	28
Depth of surface to bottom of first string	2,500	1,100	1,127
Number of days to drill and cement second string	55	71	20
Depth of bottom first to bottom second string	300	972	935
Number of days to drill and cement third string	83	121	.....
Depth of bottom second to bottom third string	380	951	.....
Number of days to drill and set oil string	210	162	16
Depth last shut-off to bottom of hole	258	917	234
Total depth	3,358	3,940	2,296
Total drilling time (in days)	423	438	99

Table 2 — Montebello Company Drilling

Number of days to drill and cement first string	49	31	44	57
Depth of surface to bottom of first string	2,264	1,691	2,159	2,358
Number of days to drill and cement second string	.....	33	.....	.....
Depth of bottom first to bottom second string	.....	209	.....	.....
Number of days to drill and cement third string	.....	.....	.....	.....
Depth of bottom second to bottom third string	.....	.....	.....	.....
Number of days to drill and set oil string	31	78	35	163
Depth last shut-off to bottom of hole	351	690	353	277
Total depth	2,615	2,590	2,512	2,635
Total drilling time (in days)	135	164	109	241

Table 3 — Wildcat Company Drilling

Number of days to drill and cement first string	37
Depth of surface to bottom of first string	506
Number of days to drill and cement second string	65
Depth of bottom first to bottom second string	934
Number of days to drill and cement third string	67
Depth of bottom second to bottom third string	695
Number of days to drill and set oil string	136
Depth last shut-off to bottom of hole	460
Total depth	2,595
Total drilling time (in days)	365

Table 4 — Midway Contractor Drilling

Number of days to drill and cement first string	13	12
Depth of surface to bottom of first string	1,822	1,658
Number of days to drill and cement second string	30	.....
Depth of bottom first to bottom second string	18	.....
Number of days to drill and cement third string	.....	.....
Depth of bottom second to bottom third string	.....	.....
Number of days to drill and set oil string	54	35
Depth last shut-off to bottom of hole	210	52
Total depth	2,050	1,710
Total drilling time (in days)	97	47

Average progress per day in feet:

	Tables 1	2	3	4
To drill and cement first string	62	46	14	139
To drill and cement second string	10	21½	14	0.5
To drill and cement third string	6½	....	10	...
From last shut-off to bottom	3	5	3	3
For total depth	8½	17	7	26

Average progress in feet per day to depth of 1,740 ft.: Contractor..... 139
Average progress in feet per day to depth of 1,900 ft.: Company..... 54

As these wells will be drilled in a proven field, the gas and water lines will be short, and the boilers will be moved from a nearby well; neither new roads nor houses are necessary. Under such conditions the estimates are useful to a company with funds and field equipment to meet any conditions which may arise. It is not intended that the figures should be taken as a basis on which to judge the total possible cost of any well of the same depth. Wildcat wells would cost much more.

The following is a bill of material for the 106-ft. standard rig:

LUMBER (O. P. ROUGH)

Pieces	Size	Use
1	24x24″x 9′	Engine block
1	16x16″x30′	Main sill
2	16x16″x18′	Subsill and tail sill and jack posts
6	16x16″x16′	4 for mudsills, 2 for bull wheel shaft
1	16x16″x16′	Sampson post
2	14x14″x14′	Mudsills for engine
3	14x14″x12′	2 for pony sills for engine; 1 for nose sill
1	12x12″x22′	Bull wheel post
2	12x12″x24′	Calf wheel posts and collar
1	12x12″x18′	Derrick tops and sand reel brake
2	8x10″x24′	Side sills
10	8x 8″x22′	Floor sills and underpinning
1	6x 6″x24′	Bunting pole
3	6x 6″x18′	Jack post braces
2	4x14″x14′	2 Sampson post braces
2	6x 6″x14′	1 underpinning 1 headache post
3	6x 8″x20′	Casing rack
2	6x16″x16′	1 crown block
	(Cut to 8′ lengths)	1 spool for B. W.
2	6x16″x12′	1 crown block 1 knuckle post
6	4x 6″x18′	Keys, calf and bull wheel braces
2	4x 4″x14′	Calf wheel arms
72	2x12″x22′	Derrick floor girts
30	2x12″x20′	Calf and bull wheel arms, legs, wall header, and footings
6	2x 6″x16′	Engine house, bull wheel spool
4	2x 4″x24′	Belt house
20	2x 4″x16′	Ladder and belt house
4	2x10″x18′	Starting legs
4	2x 4″x14′	Engine house
28	2x12″x18′	Doublers, front and back
20	2x10″x16′	Derrick legs
4	2x10″x32′	Derrick legs
22	2x 8″x20′	Derrick leg braces
16	2x 8″x18′	Sampson posts and derrick braces
14	2x 8 ″x16′	Roof frame, derrick braces
24	1½x12″x20′	Girts for derrick
28	2x12″x16′	Legs
125	1x12″x16′	Belt house, engine house
25	1x12″x18′	Forge house, bull wheel house
30	1x12″x14′	Derrick roof
26	1½x 8 ″x24′	Derrick braces
54	1½x 8″x16′	Derrick braces
8	1x 6″x16′	Ladder steps
8	2x 8″x22′	Derrick braces
103	1x12″x20′	15 for forge house, 5 for derrick roof, 83 for belt house
8	2x 8″x18′	Diagonals for wind bracing
16	2x 8″x20′	Diagonals for wind bracing
8	2x 8″x22′	Diagonals for wind bracing
8	2x 8″x24′	Diagonals for wind bracing
4	2x10″x12′	Girts for wind bracing
6	2x10″x16′	Girts for wind bracing
4	2x10″x18′	Girts for wind bracing
5	2x10″x20′	Girts for wind bracing
1	12x16″	Walking beam, 26 ft. long
	12x30″	Selected
	12x16″	Selected
1	5x 9″	Selected
	5x14″x 9′	Swing lever
8	3x12″x18′	Redwood selected Derrick footing cut to 6 ft. lengths
1	16x16″x 6′	W. oak selected, calf wheel shaft
1	4x 6″x16′	W. oak, crown block lagging, cut to 8 ft. lengths
1	6x 8″ 6x14″x11′	W. oak pitman
1	4x 6″x12′	W. oak lagging for crown block, cut 6 ft. lengths
1	3x12″x 6′	W. oak lagging for walking beam, cut 3 ft. lengths
35	1x12″x20′	O. P. S. I S. band wheel
56	1x 8″x10′	Sugar pine, circular cants, plain band wheel, double tug
8	3x 8″x 7′	S. P., C. C., plain band wheel, double tug
16	3x 8″x 7′	S. P., C. C., grooved band wheel, double tug
24	1x 8″x 7′	S. P., C. C., plain band wheel, double tug
16	3x 8″x 8′	S. P., C. C., grooved bull wheel, double tug
8	3x 8″x 8′	S. P., C. C., plain bull wheel, double tug
88	1x 8″x 8′	S. P., C. C., plain bull wheel, double tug
32 lin.ft.	1⅝″	Round O. P. bull wheel pin
8	3x 8″x 7½′	S. P., C. C. plain calf wheel
40	1x 8″x7½′	S. P., C. C., plain calf wheel

NAILS

Full Weight	Size	Kind
150 lb.	10d	Common wire
150	20d	Common wire
160	30d	Common wire
100	60d	Common wire

BOLTS

No. Pieces	Size	Kind	Where Used
1	1¼″x14′ 8″	D. E. 5″ and 3″ thread	Main sill to girts
1	1¼″x12½′	Turnbuckle	Sampson post
1	1¼″x11½′	Turnbuckle	Sampson post
4	1″ x20″	Eye	Sampson post
1	1″ x30″	Machine	Jack post
1	¾″x7½′	D. E.	Knuckle post to sill
4	¾″x34″	D. E.	Walking beam
4	¾″x30″	D. E.	Engine
1	¾″x30″	Machine	Walking beam
2	¾″x34″	Machine	Engine brake beam
2	¾″x28″	Machine	Walking beam
2	¾″x20″	Machine	Miscellaneous
30	¾″x18″	Machine	Miscellaneous
10	¾″x16″	Machine	Miscellaneous
14	¾″x14″	Machine	Miscellaneous
12	¾″x12″	Machine	Miscellaneous
12	¾″x10″	Machine	Miscellaneous
8	¾″x12″	Machine	Calf wheel rim

Fig. 1 shows in plan and cross-section the foundation for the 106-ft. combination derrick. The method of anchoring the guy ropes is shown in Fig. 2.

One set of 6-in. Ideal or Imperial rig irons, to consist of the following:

No. Pieces	Name
1	6″x7½′ crank shaft complete, with flanges, collars, keys and bolts
1	Crank with wrist pin
1	42″ sprocket tug
1	42″ sprocket tug clutch, tug and strap
1	Set clutch levers
1	84″ sprocket tug rim
1	6x14″ jack post box and cap, crank end
1	6x12″ jack post box and cap, clutch end
4	1¼″x8½′ turnbuckle rods
2	1¼″x8′ jack post rods, crank end
1	2x6″x22″ jack post plates, to fit above 1¼″ rods
2	1¼″x7′ jack posts rods, clutch end
2	¾″x18″ eye bolt, for jack post
2	¾″x8½′ hook rods, brake to jack post eye bolts
1	Set 5′ saddle irons, with four ¾x34″ machine bolts and six 1x20″ machine bolts
1	Set 16″ bull wheel gudgeons with ¼x3″ W. I. bands, and eight 1x20″ machine bolts with 2 square nuts
1	Set 16″ and 30″ calf wheel gudgeons with ¼x23″ W. I. bands and four 1″x5′ 8″ D. E. rods
1	¼x7x28″ bull wheel brake band with 1¼″ lever and staple
1	¼x6″x28′ calf wheel brake band with 1¼″ lever and staple
1	2½x30″ W. I. walking beam stirrup 54″ long with bolts
1	36″ heavy crown sheaves with 4½″ cast gudgeons
1	24″ sand line sheaves with 4″ cast gudgeons
4	22″ casing line sheaves with 4½″ cast gudgeons
1	Double sand reel, W. 40″ boiler flanges, 42x12″ solid webb friction pulley on 4″x9′ shaft with keys, collars, etc.
1	1½″ sand reel lever
1	60′ length sprocket chain

WASHERS

Weight	Size
6 lb.	¾″ cut washers
12	1¼″ C. I. washers
4	1½″ C. I. washers
12	1″ C. I. washers
12	¾″ C. I. washers
85	½″ C. I. washers

2,400 ft. of ⅜″ guy wire.

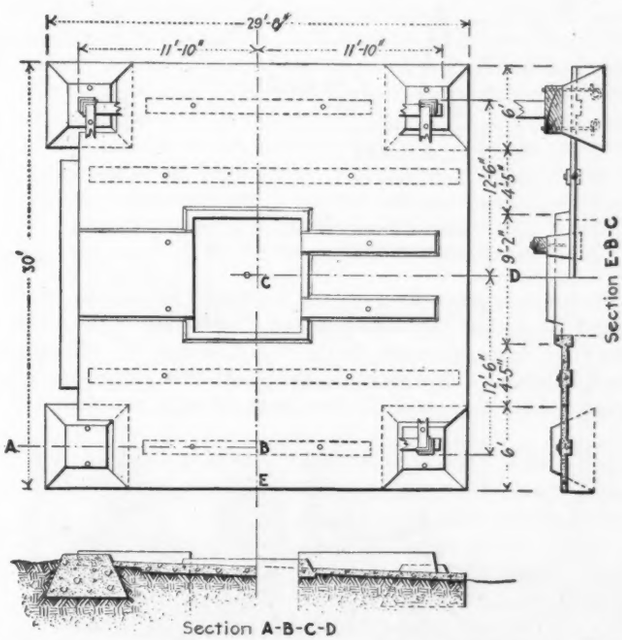


FIG. 1. PLAN AND CROSS-SECTION OF FOUNDATION FOR 106-FT. COMBINATION DERRICK

Additional material for 106-ft. rig, when used with rotary tools:

LUMBER (O. P. ROUGH)

Pieces	Size	Use
1	24x24″x 9′	Engine block
2	14x14″x14′	Mud sills
2	14x14″x12′	Pony sills
2	8x10″x18′	Posts and engine strut
2	4x12″x22′	Girts
1	8x 8″x16′	Blocking for engine
1	12x12″x18′	Blocking for rotary
35	1x12″x22′	Engine house
3	2x 6″x16′	Engine house
2	2x12″x14′	Engine house
2	12x12″x18′	Mud sills
1	8x 8″x14′	Blocking sills to floor sills

BOLTS

No.	Size	Kind	Where Used
4	⅞x30″	D. E.	Engine to block
2	1 x15½″	D. E.	Engine block to side sill
3	¾x13″	Machine	Posts
6	¾x14″	Machine	Girts

WASHERS

Weight	Size	Kind
4	1″	C. I.
8	⅞″	C. I.
18	¾″	C. I.

NAILS

50 lb.	10d	Common wire

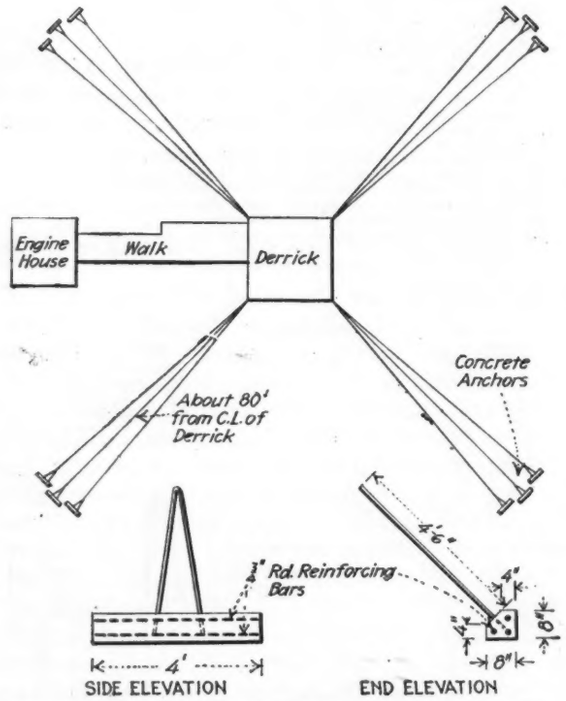


FIG. 2. METHOD OF ANCHORING GUY ROPES FOR COMBINATION DERRICK

The maximum wage of rig builders as set by the Board of Labor Arbitration for California is so low that the mid-continent fields would draw all of this class of labor. The operators have met this situation by having their rigs built by contractors who are free to

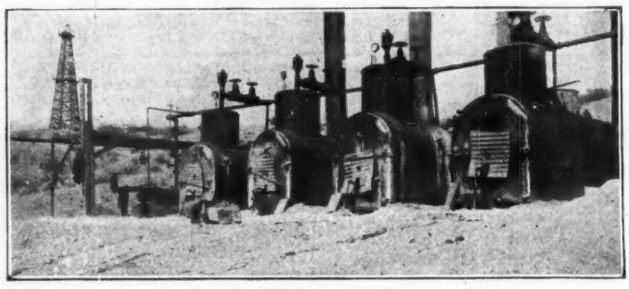


FIG. 3. TYPICAL BOILER INSTALLATION FOR DRILLING A DEEP WELL

pay such wages as will hold the men of this trade. The present scale paid by contractors averages $13 per day per man for all labor on rig building.

The time required to build and rig up is shown below:

84-FT. COMBINATION DERRICK

Time required to build	6 days
Time to rig up rotary	7 days

106 OR 114-FT. COMBINATION DERRICK

Time required to build	9 days
Time to rig up rotary	11 days

Fig. 3 is a photograph of a typical boiler installation to be used in the drilling of a deep well. The photograph also shows the upper portion of the derrick over the well to be drilled. The necessary equipment to set up such a battery of boilers is listed below:

9	3x6″ nipples	
4	3″ American pop valves	
4	¾x6″ nipples	
4	¾″ globe valves	to construct drain between header gate
8	3″ rising steam screw and yoke type globe valve	
12	3″ 250-lb. crane tees	
6	3″ 250-lb. crane ells	
3	Joints 3″ line pipe	
2	3″ 6-bolt flange unions	
2	3″ L.C. gate valves	
2	3x2″ swage nipples	
2	3″ plugs	
	Cost	$547.73
	Steam pumps:	
1	3x1″ swage nipples	
3	1″ globe valves	
4	1″ tees	
2	1″ plugs	
3	1″ ells	
2	1x2″ nipples	
2	1x6″ nipples	
2	1x½″ bushings	
2	½x4″ nipples	
1	1 qt. Detroit sight feed lubricator	
	Cost	22.70
	Exhaust from pumps:	
2	¾x2″ nipples	
2	¾x1″ bushings	
3	1″ ells	
2	1″ L.C. gate valves	
4	1x4″ nipples	
1	1″ tee	
2	Joints 1″ line pipe	
	Cost	7.91
	Water discharge (from pumps):	
4	1½x6″ nipples	
2	1½″ L.C. gate valves	
2	1½x2″ bushings	
12	2″ tees	
2	2″ plugs	
2	Joints 2″ line pipe	
4	2″ L. C. gate valves	
4	2″ 250-lb. brass globe valves	
4	2″ horizontal brass check valves	
4	2″ unions	
12	2x4″ nipples	
12	2x6″ nipples	
4	2x1½″ reducers	
4	1½x6″ nipples	
	Cost	93.42
	Blow-off:	
16	2x6″ nipples	
4	2″ everlasting blow-off valves	
4	2″ unions	
4	2″ tees	
4	2″ ells	
8	Joints 2″ line pipe	
	Cost	110.47
	Suction to pump:	
8	2x4″ nipples	
3	2″ L. C. gate valves	
3	2″ ells	
4	2″ tees	
4	2″ plugs	
2	2″ Kewanee lip unions	
2	Joints 2″ line pipe	
	Cost	30.85
	Gas burners:	
4	2″ tees	
4	2x1″ bushings	
4	2x12″ nipples	
1	Joint 1″ pipe	
2	Joints 2″ line pipe	
4	1″ ells	
4	1″ globe valves	
	Cost	21.60
	Material and fittings for boilers:	
4	Joints 6 or 8″ salvage pipe	
750	Fire brick	
4	5″ steam gages, 250 lb.	
4	½″ brass syphons	
12	½″ gage cocks Comp.	
4	½″ Michigan water gages	
12	Water glasses	
1	100 bbl. water tank	
2	Water feed pumps	
	Cost	373.26
	Boilers:	
4	40 hp. fire-box boilers at $1,000 each	4,000.00
	Labor required to set boilers	298.00
	Total	$5,505.88

The well shown in Fig. 3 is so far from proved territory that it was necessary to build several miles of road,

lay ten miles of 4-in. water line, and three miles of 2-in. gas line. If this well proves to be a dry hole, the entire cost (approximately $250,000, with bonus for land), naturally will have to be charged to the one well.

To the mining engineer who is unfamiliar with oil field operations it will doubtless seem strange that such an expenditure would be undertaken without some assurance of success. If oil operators demanded as much evidence of the presence of oil as the large mining companies demand of the presence of ore, few if any new fields would be developed. Picture to yourself any one of the large mining exploration companies paying a cash bonus and 12½ per cent royalty for land simply because a prospect shaft is being sunk from one to five miles away! This is what the oil companies are actually doing every day.

How Many Wells Drilled Produce Oil?

The questions are often asked, says the Investment Bulletin of Henry L. Doherty & Co., "What percentage of wells drilled fail to produce oil?" and "Is the oil business an extra-hazardous industry?"

To the large company with ample capital and drilling many wells in various districts, the industry may be considered safe and non-hazardous, but the small company with capital to drill but one or two wells is engaging in an extra-hazardous business. In some respects, the producing oil industry may be compared to the life-insurance business, in that it is a business in which averages play a large part. The life-insurance company with only a few risks is engaged in a hazardous operation, but the company with thousands of risks is engaged in one of the safest businesses that can be conducted.

Statistics indicate that in 1919 approximately one well out of every five wells drilled failed to produce oil. It should be noted that where a well produces gas and not oil, that well is not a loss but usually is a source of good income. In the following table will be found reports of the operations of producing companies in the oil districts east of the Rocky Mountains in 1919, showing a total of 28,473 wells completed, of which 71.33 per cent were oil producers, 7.81 per cent gas producers and 20.86 per cent were dry holes. The total initial daily production of the oil wells completed in 1919 in the districts east of the Rocky Mountains was 3,365,943 bbl., an increase of 1,879,884 bbl. of initial daily production over the total initial production of the wells completed in 1918, in which year there were 3,515 fewer wells completed than in 1919.

EASTERN OIL PRODUCTION, 1919

Districts	Completions	Oil Per Cent	Gas Per Cent	Dry Per Cent	Dry and Gas Per Cent
Pennsylvania	5,178	73.29	12.16	14.54	26.70
Lima, Indiana	854	79.25	1.67	19.07	20.74
Central Ohio	940	47.87	28.61	23.51	52.12
Kentucky-Tennessee	3,716	85.04	3.63	11.32	14.95
Illinois	370	68.38	1.35	30.27	31.62
Kansas	3,432	75.87	5.48	18.65	24.13
Oklahoma	8,196	62.40	9.95	27.65	37.60
North Texas	3,564	81.87	1.34	16.78	18.12
North Louisiana	704	72.58	9.94	17.47	27.41
Gulf Coast	1,236	52.59	2.02	45.39	47.41
Wyoming	303	62.37	8.91	28.71	37.62
Totals	28,473	71.33	7.81	20.86	28.67

Ford's New Car Motor Ready

A prospective field for the use of petroleum products which may assume large proportions is opened by the completion of Henry Ford's first internal combustion engine-driven interurban car. This is now ready to make a trial run from Detroit to Chicago, in front of the Wolverine express, according to the *Wall Street Journal*. Work is also under way on a city car model.

The Ford company is going ahead with plans for quantity production. "We expect to have a plant two miles long in Dearborn to build these cars," said Charles E. Sorensen, chief engineer. "A feature of the new interurban car is its lightness. It weighs ten tons, compared with thirty-five tons for the standard interurban car now in use."

How Well Do Lubricating Oils Lubricate?

Some of our readers have no doubt noticed the series of articles on lubricating oils recently published in *The Forum* by Dr. Edward G. Acheson, the inventor of deflocculated graphite, and former president of the American Electrochemical Society. Dr. Acheson has much fault to find with the present process of preparing petroleum for lubricating purposes, methods which he considers unscientific, uneconomical, and tending to a useless waste of a valuable natural resource which exists in only limited quantities. The acid and filtration treatment, he points out, are useless refinements, designed to add to the appearance of oils at the expense of their lubricating value. The refiners, of course, not only make a profit off the unnecessary treatment, but actually sell more oil than would otherwise be necessary.

The clarification, Dr. Acheson explains, removes some of the colloidal matter to which the oil owes its lubricating value. This statement we are inclined to doubt. We believe that it has by no means been proved that all colloids are lubricants or that all lubricants are colloids. Crude distillates which Dr. Acheson proposes using contain numerous unsaturated hydrocarbons, which, when exposed to heated air, are rapidly oxidized to gummy compounds, really asphalts, which we have always believed to be undesirable substances in high-speed bearings.

Thirty-four million barrels of lubricating oil were produced in 1918, according to Dr. Acheson. This figure, by the way, is twice that given by the U. S. Government. If American users of lubricating oils are being hoodwinked by the refiners to the extent of thirty-four or even seventeen million barrels annually, it is time we had the facts in the case. Let us have some actual figures from some of the recognized authorities who, Dr. Acheson says, have confirmed his views. Let us also hear from some of the large users of lubricants. What actual tests have they made to show that ordinary cheap distillate, either with or without a small addition of deflocculated graphite, will not perform to better advantage the work required of the present so-called high-grade lubricating oils? It would not be expensive to make tests, and the subject is highly important, even if we cannot agree with the statement in *The Forum* that "one-half of the coal used to make steam and develop power is lost, due to friction."

The Anglo-Persian Oil Co., according to *Commerce Reports*, is expending £6,000,000 at Skewen, Wales, on a refinery, and at Swansea, six miles distant, on a distributing depot. A pipe-line will connect the two places. The first crude oil cargo is expected to arrive in Swansea harbor in April of this year.

NEWS FROM THE TEXAS OIL FIELDS

Texas Rangers Peacefully Seize Burk-Divide Property

Production and Development Go On and Money Is Put in Escrow While Ownership Is Fought Out in the Courts

Another step in the Burk-Divide controversy on the Texas-Oklahoma border was taken on Jan. 26, when Texas Rangers and a deputy sheriff with an injunction order from Texas took possession of this property from the armed deputies of Tillman County, Okla. The occupation by the Texans and the withdrawal of the Oklahoma officials was done peacefully, although it was feared at one time that an armed conflict might take place. On Jan. 29, H. L. Hunter was named receiver of this property by the district court of Travis County, Tex. He will sell oil from it and continue the development of the property, putting all money in escrow.

The Governor of Oklahoma sent Adjutant General Charles F. Barrett and Colonel B. H. Markham of the Second Oklahoma Infantry to investigate the situation after the property had been taken over by the Texas authorities, and to advise whether troops were needed to maintain order. A later report stated that an agreement had been reached in which the Oklahoma claimants would make no forcible attempt to regain the property, but would leave the decision to the courts.

Gas Waste Ordered Stopped

The White Point gas well, near Corpus Christi, has been ordered closed by the oil and gas division of the Texas Railroad Commission. This is one of the largest gas wells in the state, and has been running wild for nearly three years. Millions of feet of gas have been wasted. If the well cannot be brought under control and shut down it must be destroyed.

The Hull field continues to be the chief producing field of Liberty County, the daily production ranging from 6,000 to 7,000 barrels. Recent developments of interest in this field are the completion of the Gulf Production Co.'s No. 4 Phoenix well, which came in making 1,000 bbl. daily, but which rapidly decreased to 200 bbl., and the testing of the Texas Co.'s No. 2 Palmer well. The major production in this field is still made by the Republic Production Co. and the Gulf Production Co., with the Sun, Higgins, Texas, Humble and Big Four companies contributing minor amounts. At Barbers Hill, the result of bailing No. 1 Fisher well of the United Petroleum Co. is awaited with interest, as the well, 2,700 ft. deep, is much deeper than other wells of this district.

Packer Failed in Texas Company's Big New Gusher

Is the Largest Producing Well Ever Brought In in West Columbia Field —Hope That Well May Be Saved

The No. 30 Hogg well, brought in on Jan. 28 by the Texas Co., is the largest producing well ever completed in the West Columbia field of Brazoria County. It flowed for three hours at the rate of 30,000 bbl. a day from a depth of 3,400 ft.; it was then choked down so that it could flow only 5,000 bbl. daily. A few days later, however, it began flowing mud, and then oil and water. This indicates that the packer has failed, but it is hoped that the well can be saved.

Aside from its phenomenal production, this well is of importance because it is the easternmost well in the section, and an effort will undoubtedly be made to extend the field in that direction. In fact, the Texas Co. is already planning on drilling two more wells, 200 and 400 ft. east of No. 30. The No. 31 Hogg well is now being tested.

One of the first big wells of the field, No. 1 Giraud, belonging to the Humble Oil & Refining Co., has been abandoned after producing over 1,000,000 barrels.

For the week ended Jan. 31, the daily production from the West Columbia field increased to nearly 19,000 bbl., the Humble Oil & Refining Co. being the largest producer with 12,000 bbl.; the Texas Co., second, 3,000 bbl.; and the Crown Oil & Refining Co., third, with 1,800 bbl. Near Angleton, in Brazoria County, the Williams well and the well of the Angleton Co-operative Oil Co., are still drilling. Drilling at Stratton Ridge is progressing satisfactorily, but with no new discoveries. At Damon Mound, the Sinclair Co. is down 4,650 ft. in its No. 2 Ptak well. This is probably the deepest test well in the Gulf Coast country.

Texas Co. Buys Thirteen Vessels

The Texas Co., through its subsidiary, the Texas Steamship Co., has just increased its ocean transportation facilities, by the purchase of the United States Shipping Board tanker "Dirigo," recently out of drydock at Galveston. It is reported that the company has purchased thirteen vessels in all, eight of them completed and five being built, the total price being about $20,000,000. The Texas Co. is also establishing fuel oil stations in Cuba in anticipation of the increasing use of fuel oil for locomotives on Cuban railroads.

The tank steamer Freeport No. 1 arrived at the Sinclair dock, Houston, on Jan. 29 with 21,300 bbl. of crude from Tampico for the Eastland Oil Co.

Active Development of Properties in Harris County

Humble Field Thought To Extend Across San Jacinto River—Many Completions Reported in Goose Creek Territory

In the Humble field of Harris County new drilling by the Texas Co. is expected to prove an extension of the field on the north side of the San Jacinto River. During January that company brought in a good well on the south side of the river, and the new well is being drilled directly across from it. Another well is being drilled about a mile to the northwest, and is said to have struck sand. Most of the intervening land is owned in fee by the Texas Co. Wells brought in recently in the Humble field are the No. 9 Bart, of the Circle Oil Co., and the No. 3 Bering-Cortes, of the Walker Oil & Refining Co., both making a small production by pumping; and the No. 241 Landslide, of the Texas Co., pumping 150 barrels.

In the Goose Creek field of this county, completions were reported by the Sun Oil Co., the Texas Co., the Goose Creek Oil Co., and the Standard Oil Co. of Texas. Of these, the No. 31 Smith of the Sun Oil Co., is producing 750 bbl. from 3,300 ft. Other completions included the Gulf Coast-Crown Co., joint well No. 25 Gaillard, flowing 250 bbl.; Simms Co., No. 18 Sweet well, pumping 150 bbl.; F. B. West and associates, No. 3 Wright, preparing to pump; Humble Oil & Refining Co., No. 4 Jones-Stateland, pumping 50 bbl., and No. 8 Jones-Stateland, also pumping about the same amount. These wells are from 2,200 ft. to 2,800 ft. deep.

Will Build 8-in. Pipe Line From Ranger to Texas City

The White Pipe Line Co., a subsidiary of the White Oil Corporation, filed its charter in Austin on Jan. 26. The capitalization is $100,000, but this may be increased from time to time. The first work by the company will be the construction of an 8-in. pipe line from Burkburnett and Ranger to Texas City. All preliminary work is finished, materials are being received, and the construction will begin at once. The oil will be refined in the projected 15,000-bbl. refinery of the White Oil Corporation to be started in 30 to 60 days.

The Batson field, Hardin County, is making a production of over 1,000 bbl. daily now. At the present time, only one new well is being drilled, the No. 1 Le Garza of the Humble Oil & Refining Co. In this county, the Gulf Production Co. has worked over its No. 32 Hardin at Sour Lake, which is now making a good production by pumping.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

A. I. M. E.

New York Section Elects Officers at February Meeting—Foreign Trade Discussed in Addresses

The February meeting of the New York section of the American Institute of Mining and Metallurgical Engineers was held at the Machinery Club, 50 Church St., New York, on Feb. 4, 1920. The following officers were elected for the ensuing year: Chairman, E. P. Mathewson; vice-chairmen, William Y. Westervelt and D. M. Liddell; treasurer, E. L. Gruver; committeemen, S. H. Ball and Amor F. Keene. About fifty-five members were present.

G. A. O'Riley, of the Irving National Bank, introduced the subject of Foreign Trade, and expressed the belief that Americans had no right to be pessimistic over the outlook, in spite of the numerous adverse influences which now militate against a settlement of our disturbed industrial conditions.

Dr. John Franklin Crowell, of R. G. Dun and Co., editor of *World's Markets*, referred to aspects of world trade of interest to engineers, particularly its relation to our metal and mineral production.

Dr. Crowell said that the silver situation in the world's market raised hope in a new direction. Far Eastern countries that have absorbed immense quantities of precious metals, and have either hoarded them or used them in the arts, are beginning to awaken to the customs, advantages, and possibilities of modern methods of trade. The construction of new railroad lines from seaports to growing centers of production in the interior will soon make possible the rapid development of natural resources. The hoarded silver of Far Eastern nations is a vast reserve of wealth about to come out as a factor of usefulness, as these countries awaken to modern business methods.

Elisha Friedman, who is affiliated with the War Finance Corporation, traced the development of world trade, and outlined the reciprocal needs of nations.

Mr. Friedman also referred to the complete breaking up of the focus of industries in Germany, as a result of the war, and expressed the belief that most of this economic decentralization would be permanent, and to the world's advantage. However, he warned that an economic boycott of Germany would not work, because many nations could use Germany's manufactures to advantage, and Germany was an important consumer of raw materials, especially of cotton and coffee

V. Gonzales, of the Mercantile Bank of Americos, discussed foreign exchange, basing his arguments on the assumption that there were only three factors to consider in economic movement, namely, labor, capital, and the state. He attributed the present erratic movements in exchange rates to the unbalanced condition in international trade, and proposed the issue of international bonds as a possible solution of present strained financial conditions, a suggestion with which his audience was not in complete agreement.

Alloys of Aluminum Discussed

New York Sections of Engineering Societies Take Up Use of That Metal as an Engineering Material

Last Tuesday evening the New York sections of the national societies of mechanical, mining, and automotive engineers held a joint meeting for the purpose of discussing the use of aluminum as an engineering material. G. M. Rollason, assistant director of research for Aluminum Manufacturers, Inc., of Cleveland, gave the principal address, which was illustrated by lantern slides.

About 50 per cent of the aluminum produced is used in the form of an alloy, and it is in this form, as castings, that the metal is utilized for engineering purposes. The rest of the production goes into the manufacture of kitchen ware and miscellaneous articles. For electrical purposes the metal is on a parity with copper when the latter sells for 15c. and aluminum for 25c. Aluminum castings are in general of three kinds: those in which green sand is used for the mold; die castings used for fine work, in which a pressure of 400 to 500 lb. is used to force the metal into every crevice; and castings in which a metallic mold is used without pressure. The second form is a comparatively recent development, and several interesting examples were shown. The aluminum piece on which the spark and gas control lever of automobiles revolves is, for example, made by this means.

The most generally used alloy of aluminum is that known as No. 12, and which contains 92 per cent Al and 8 per cent Cu. This has a tensile strength of 20,000 lb. per sq.in. and an elongation of 1½ per cent. Other favorite alloys run a little higher in Cu and some contain Fe and Zn. An alloy containing the last two metals is of particular interest, for the reason that its tensile strength does not decrease up to 250 deg. C. and it can, therefore, be used for piston heads and such purposes. Aluminum-zinc alloys have found favor in Europe, but American foundrymen prefer copper to zinc.

Most of the copper and aluminum in the alloys takes the form of a solid solution.

Two New U. S. Base Maps

Lambert's Equal Areas and Conformal Conic Projections Used in Work of Coast and Geodetic Survey

An outline base map of the United States on the Lambert Zenithal Equal Area projection, scale 1 to 7,500,000, dimensions 19¾ x 25¾ in., price 15c., has just been issued by the Coast and Geodetic Survey. The map covers the whole of the United States, and includes most of Mexico. Only state names and boundaries, principal rivers, capitals and largest cities are shown, the chief object being to furnish a base map for political, census, or statistical purposes on a projection in which the property of equivalence of area is one of the essential features.

The two errors, to one or both of which all map projections are liable, are change of area and distortion, as applying to portions of the earth's surface. The former error is perhaps best illustrated by the Mercator projection, the projection being responsible for many false impressions of the relative size of countries differing in latitude. Likewise the polyconic projection, when used for the whole of the United States, has the serious defect of exaggerating the areas of its eastern and western limits.

An outline base map of the United States on the Lambert Conformal Conic projection, with two standard parallels, scale 1 to 5,000,000, dimensions 25 x 39 in., price 25c., has also been issued by the Coast and Geodetic Survey. This map is similar to the other in general treatment. It is larger in scale, but limited to the area of the United States. The map is based on the same system of projection as that employed by the allied forces in the military operations in France.

The value of this new map is indicated by the fact that throughout the larger part of the United States, that is, between latitudes 30½ and 47½ degrees, the maximum scale error is only one-half of 1 per cent. Only in southernmost Florida and Texas does this projection attain its maximum scale error of 2¾ per cent, implying an error in the areas at these extreme parts equal to the square of the linear distortion, or an error of 5½ per cent. The Zenithal projection is free from this inconvenience.

The choice between the Lambert Zenithal and the Lambert Conformal for a base map of the United States, disregarding scale and direction errors which are conveniently small in both projections, rests largely upon the choice of *equal area* as represented by the Zenithal and *conformality* as represented by the Conformal Conic projection.

American Association of Engineers vs. Joint Conference

A recent circular from the American Association of Engineers, 63 East Adams St., Chicago, under the signature of C. E. Drayer, secretary, says: "A debatable question no longer exists as to whether engineers of the country should get together in furtherance of their non-technical interests. The attitude everywhere is not whether, but how shall this end be achieved? Some engineers evidently think that a sort of super-organization of the founder societies should be brought into existence, or perhaps a federation of all societies, but an increasing number are coming to the conclusion that the end will be best accomplished by using the well-tried machinery at hand, designed for this purpose, namely that of the American Association of Engineers.

"A striking omission occurs in the report of the joint conference committee of the older societies, one which by its absence attracts comment throughout the rank and file of the profession, namely the neglect to refer to the fact that the work proposed to be done has already been undertaken and is well advanced by the American Association of Engineers, with a membership now larger than that of any other national society. From all parts of the United States is coming the question, 'Why has the joint conference committee's report been silent on this vital question?'

"Let us have full discussion. The great body of engineers who have given the matter thought evidently believe that the ends to be attained from the human side must be reached by a strong, well-built and thoroughly democratic organization, devoted exclusively to these ends and organized for effective action in ways which the men of experience in human and political activities have found to be most effective. On the other hand, they feel that the purely scientific societies, organized for the investigation of natural phenomena and their application, which elect for their officers men distinguished by research and technical achievement, cannot by mere federation and delegation of power through complicated machinery achieve important results for the welfare of engineers as men and citizens."

National Research Council To Have Home and Endowment

The Carnegie Corporation of New York has announced its purpose to give $5,000,000 for the use of the National Academy of Sciences and the National Research Council. A portion of the money will be used to erect in Washington a suitable home for the two beneficiary organizations. The remainder will be placed in the hands of the academy, which enjoys a federal charter, to be used as a permanent endowment for the National Research Council.

The Standards Committee

The American Engineering Standards Committee is composed of twenty-four members, three each from the following: American Society of Civil Engineers, American Institute of Mining & Metallurgical Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Society for Testing Materials, U. S. Departments of Commerce, of the Navy, and of War. These organizations have now ratified the revised constitution, bylaws, and rules prepared under the chairmanship of Prof. C. A. Adams.

This new committee will co-operate with similar organizations in Canada and abroad, in the hope of giving international status to approved American engineering standards. The permanent secretary is Dr. P. G. Agnew, Engineering Societies Building, 29 West 39th St., New York City.

Thomas Alva Edison, "73"

On Feb. 11, 1920, Thomas Alva Edison celebrated his seventy-third birthday, and the *Engineering and Mining Journal* welcomes the opportunity to join in writing "73" after his name.

THOMAS ALVA EDISON

Edison was born at Milan, Ohio, on Feb. 11, 1847, of a family with a strong Dutch strain that always took an active and honorable part in the history of the colonies and the young republic.

In 1862 Edison became familiar with electricity while learning telegraphy from a railroad man whose child he had rescued. In 1880 he had worked out ideas for a practical magnetic ore separator, and ten years later he began the ore-crushing and separation plant in western New Jersey on which he worked with great ingenuity until the Mesabi Range deposits of bessemer ore, discovered in 1901, made it impossible for him to compete.

Among the honors and tributes to his services that have come to Edison the one that must touch him most was the organization, on his birthday in 1918, of the Edison Pioneers, whose members are men associated with him in his work and enterprises up to 1885.

The Relation of Gold Reserve to Paper

The world is suffering under high prices such as the rising generation has never known; mutual distrust fostered by the war and by the many conflicts between Organized Labor and Organized Capital, has given rise to widespread charges of profiteering; the true underlying cause of present prices is set forth in a recent study of world currency and indebtedness by the National City Bank of New York, published in "The Americas." The essential results of the study are given in the following table.

PAPER, GOLD RESERVE, AND RATIO OF GOLD TO NOTES OF 30 PRINCIPAL COUNTRIES

(In millions of dollars, 1914 face value)

	July 1914	November 1918	December 1919
Allies:			
Notes	4,912	24,970	29,591
Gold	3,763	5,217	5,071
Per Cent Gold	76.6	20.9	17.1
Central Powers:			
Notes	1,197	12,305	18,771
Gold	595	686	327
Per Cent Gold	49.7	5.5	1.7
Neutrals:			
Notes	1,166	2,261	2,421
Gold	516	1,371	1,451
Per Cent Gold	44.3	60.6	59.9
Total:			
Notes	7,275	39,545	50,783
Gold	4,874	7,274	6,849
Per Cent Gold	70.0	18.4	13.7
United States:			
Notes (a)	1,056	3,643	4,051
Gold	1,023	...	2,107
Per Cent Gold	99.6	63.2	52.3

(a) Excluding gold and silver certificates.

This study shows that while the gold reserve of the modern commercial world has increased but 40 per cent since July, 1914, the paper currency has increased 600 per cent (excluding Russian Bolshevik paper). World national debts have increased from 40,000 millions in 1914 to 260,000 millions of dollars in 1919, and the use of checks as circulating medium has increased with the bank deposits.

McNeill's Code Freed From Britain's Embargo

Bedford McNeill, author of the well-known mining telegraphic code, and at one time president of the Institution of Mining and Metallurgy, was employed by the British government as a special constable during the war to watch bridges. The exposure incident to this service, working on his not very rugged constitution, brought on an illness from which death resulted. Mr. J. B. Tyrell writes us from London that McNeill's code was among those not permitted by Britain during the war, and that the resulting decrease in returns from its sale has worked considerable financial embarrassment to McNeill's widow, who is not well to do. Fortunately, the government removed its embargo from that code last July, and we would bring to our readers' attention the fact that by using a new copy of McNeill's work they not only serve their own interests but contribute to the support of the widow of a much-beloved mining engineer, who deserved well of his profession and his country.

THE MINING NEWS

LEADING EVENTS

Difficulty in Obtaining Jurors Delays Deportation Trial

Out of Five Hundred Veniremen Called Three Hundred Appear in Court at Tombstone, Ariz.

At the trial of the Bisbee deportation cases at Tombstone, Ariz., deputy sheriffs were able to find fewer than three hundred men of the venire of five hundred drawn on Feb. 6, that had been ordered to report for duty on Feb. 10. On this day, the trial of Harry Wootten was resumed, Wootten being the first of the 210 defendants to be arraigned before the Cochise County Superior Court. Up to the time of adjournment on Feb. 6, of 136 talesmen questioned only twelve had been tentatively selected to sit on the jury. An additional twelve must then be obtained before the panel will be complete. Half of these men will then be subject to peremptory challenge.

Robert N. French, county attorney, who is conducting the prosecution, has said that he despairs of obtaining a sufficient number of unbiased jurymen in Cochise County to try more than a few of the defendants. In his most recent statement Mr. French said:

"From my standpoint the men responsible for the deportation from Bisbee are included in the blanket warrant. I want them tried first. If any cases are to be dismissed for want of juries to sit upon them I had rather it should not be those whom I accuse of originating the scheme.

"As you know I cannot move the trials to another county. Neither can I bring jurors from another county to Cochise County to sit in any of these cases. The privilege of obtaining change of venue lies wholly in the defense, and I do not believe that the attorneys for the defense will ask it, for the reason that they can plainly see many of their clients are bound to be freed without a trial, because of a lack of jurors. It is very evident to me, from the number of veniremen having to be examined to obtain a jury in the Wootten case, that there will be only enough jurors found to try a very few of the cases. I am anxious to have those few men tried in whom I believe I have the planners of this deportation."

Discovery of a red flag waving over the courthouse on Sunday morning, Feb. 8, and the feeling of certainty on each side to the controversy that the other side had placed it there, almost caused trouble. It was found that two youths had put up the flag in a spirit of fun, intending to ridicule the I. W. W. element involved as witnesses. Judge A. C. Lockwood failed to see any humor in the prank, bound one of the two over in bond of $300 for contempt and ordered the arrest of the other

Unionism in Northern Ontario Suffers Decline

International Membership Dwindles to One-Tenth Since Recent Strike—Porcupine Local Breaks Away

The labor situation in Cobalt and Porcupine is in a rather peculiar state at the present time. In the latter part of January, at a Union meeting held in Porcupine, it was decided to break away from the International organization. A similar meeting was held in Cobalt to vote on the same question, and despite the fact that this was one of the most important matters that has come up before the Union for a long time, less than one hundred men attended and voted at the meeting. A few months ago the Union boasted of a membership of over two thousand, and now it is believed to be less than two hundred.

At the Cobalt meeting the vote was also in favor of breaking away from the International organization, but another vote taken at the same meeting, as to whether or not they should affiliate with the "One Big Union," supposed to be the same as the I. W. W., showed a majority of fifty-one in favor of the O. B. U. As there was, however, less than 5 per cent of the workers of the camp represented at the meeting, this action could not be considered as being a representative vote of the workers, as a whole. In the event of the local Union breaking away from the International, as now appears inevitable, there is some question as to whom the Union Hall will belong to.

M. C. Keith of United Fruit Co. Said To Be in Premier Deal

One of the richest silver mines of British Columbia is the Premier mine, discovered in 1918 at the head of Portland Canal, not far from the Anyox smelter and 25 miles from deep water at Hyder and Stewart City. Less than 3,000 ft. of tunnelling has been done in this mine to date, yet it is reliably reported that $30,000,000 worth of ore, averaging $50 per ton, has been blocked out.

It has previously been stated that Guggenheim interests acquired a fifth interest in this property several months ago. It appears, however, that the transaction that took place involved the purchase of a half interest by the Guggenheims and Minor C. Keith, of the United Fruit Co., the purchase price being $3,000,000. It is interesting to learn that those making the purchase may have been acting for other large interests well-known for active development of a prominent gold mining venture

Financing a Michigan Copper Property

Seneca's Expenditures to Date Demonstrate Cost of Opening New Mine—Company Already Producing

A proper conception of what it costs to open a copper mine and put it on a producing basis may be gained from an examination of the financing of the Seneca Mining Co. This company did not have to go out and find the copper to begin work. It was reasonably certain that it would be encountered. Since the present company started work it has spent close to $3,000,000. This covers the original cost of the property, promotion, operation and equipment of plant up to date. The lode has been opened at three levels and has been tested by actual mill runs of the ore. There is some of the original treasury money still on hand, perhaps $200,000. Recently the company announced the sale of $500,000 worth of bonds and a provision for an additional $500,000 issue of stock, convertible into bonds.

This additional million ought to take care of the further financial outlays that may be necessary from time to time.

The company has announced that it already has contracted for a hoisting plant capable of handling 5,000 tons a day. This will break all the records of any hoisting plant now in operation in the Lake Superior district. Likewise if such a tonnage is contemplated it will require a stamp mill of at least eight or ten heads. The present cost of building a modern mill in the copper country may be put at $250,000 per head, so that a four-head mill, the minimum size for efficient operation, must necessarily require an outlay of $1,000,000. The railroad which will have to be built to connect the mine with the mill will also require considerable outlay. Further, the company continues to have outstanding obligations to the Calumet & Hecla company which took notes in partial payment for the mill site and for the Gratiot property which was originally secured from the Calumet & Hecla interests.

However, there is a certain source of income that may be counted upon. The Seneca is already producing copper. This production will be increased regularly as developments continue. It will not be cheap production. But the company may easily secure the continued use of a customs mill. The Seneca may be able to duplicate the history of the Ahmeek which paid its way without difficulty just as soon as the copper came in sight. Shipments at the Ahmeek were at first intermittent but continued with remarkable richness and made it possible for the

company to get properly established and to pay for its permanent hoist and other equipment without any heavy demands upon the pocketbooks of the shareholders. The Seneca had to go through 1,500 ft. of dead ground to get into the lode, whereas Ahmeek had the copper practically from the time the swamp was drained.

Seneca will continue making shipments to the Baltic mill as rapidly as the service may be secured until the stock pile is handled. The second shipment was made recently. It contained mostly stockpile rock, but included some of the material that is now coming from the underground openings in pay ore. The smelter returns on the first shipment were 22.96 lb. per ton. The mineral did not dress quite as fine as that usually secured from the Kearsarge lode ore, for the mineral return was 47 lb. per ton.

The present depth of the Seneca shaft is 2,086 ft., which is very close to the 4th level. At this level there will be some concrete work to do in the shaft for the permanent haulage way. No drifting is at present under way at the third level in the vein, both openings showing good looking faces where the work stopped. This lateral work will be resumed in the near future. The openings in the levels above, where work is being done in ore, continue to send up average Kearsarge lode material.

Unwatering the Gratiot shaft is under way. This work will be done as rapidly as possible. It is the intention of the management to start sinking the Gratiot shaft immediately. At a proper depth laterals to connect with the new Seneca shaft will be put down to provide ventilation.

Transfer of Claims by Minor Over Eighteen Held Legal

The Supreme Court of Nevada has recently rendered a decision in a case involving an unusual point of law. Austin Keyworth, a minor over eighteen years of age, sold a fourth interest in certain mining claims in the Rochester district to Frank Margrave and Mark Walser, these claims afterwards being transferred to the Nevada Packard Mines Co. Several years afterwards young Keyworth brought suit against all the parties named and asked that his deed be set aside on the ground that he could not legally transfer his interest in the claims because he was not of age.

The case finally reached the Supreme Court and in the decision of that body it was held that the acts of any minor over eighteen years of age in transferring mining property constituted legal action on his part where no fraud was shown.

The Utah Copper Company is stated to be having estimates made as to the cost of construction of a steam plant to supply power for the operation of its Arthur and Magna concentrators near Garfield, Utah.

Mason Valley Rate Decision Being Reconsidered

Railroad Administration Again Takes Up Case—Former Decision Shown Based on Unsound Reasoning

The petition of the Mason Valley Mines Co. for lower freight rates on crude ores and concentrates from the mines and mills of Plumas County, Cal., to the smelter at Thompson, Nev., which was recently denied by the U. S. Railroad Administration, is again being considered by the latter body as a result of a showing by the Mason Valley company that the decision was based upon unsound reasoning.

It is the desire of the smelter people to treat the concentrates from the Bluestone mill in Mason Valley, Nev., and from the mills in Plumas County, Cal., as well as crude ores from their own and other mines, and to do this it will be necessary to install reverberatory furnaces and remodel the smelter at a cost in the neighborhood of $1,000,000. The present freight rates from Plumas County to Thompson are prohibitive and greatly in excess per ton mile of those from Plumas County to the Utah smelters.

In denying the petition of the Mason Valley company the Railroad Administration called attention to the fact that the output of the Plumas mills was under contract to the Utah smelters until Nov. 1 next and indicated that the matter could again be taken up at that time. It has been pointed out, however, that the remodeling of the smelter cannot be completed before November even if it were started now, and that the sum which the improvements will cost cannot be safely spent until it is known how much concentrates and ore will be received. Upon this representation, the Railroad Administration reconsidered its decision.

Utah Power Co. Operating Despite Strike

The strike by some of the electrical workers of the Utah Power & Light Co. appears to be wearing itself out. In the meantime this company is supplying power and service as usual through its own employees, who remained loyal.

Replogle Steel Co.'s Prospects

By next August the Replogle Steel Co. should be in position to turn out 1,000 tons of pig iron daily from its new plant at Wharton, N. J. This will be the direct result of a $2,000,000 expenditure now being made at that point.

The two new furnaces, now being built, will have capacity for producing 1,000 tons of pig iron daily, or at the rate of over 300,000 tons per annum.

When the Replogle company was formed, to take over the iron properties of the Wharton Steel Co., it started with $5,732,000 cash in the bank; its plant and equipment were valued at $4,236,000 while other assets brought the total up to $12,121,000. No account was taken of the ore reserves, estimated to contain over 100,000,000 tons.

Utah Court Rules on Employees' Insurance Benefits

Holds Employer and Underwriter Equally Responsible for Payment in Case of Injury

The Supreme Court of Utah has decided that under the Workmen's Compensation Act both the employer and the insurance carrier are responsible for the payment of benefits to injured employees, and in case the insurance company carrying the insurance becomes insolvent and unable to pay, the burden falls upon the employer. The case in point is that of the American Fuel Co. operating a coal mine at Sego, Utah, in regard to the payment of compensation to Theras Lappas, who was injured in 1917 shortly after the law went into force. The coal company had taken out insurance in the Guardian Insurance Company, which acknowledged and paid the compensation up to the time of becoming insolvent. The decision of the court holds that the primary obligation on the part of the employer is to pay compensation and that insurance is incidental, though important.

Prince Rupert, B. C., To Have Smelter, It Is Reported

The Board of Trade of Prince Rupert, B. C., has been told that a smelter is to be installed at the townsite of Port Edward, adjacent to Prince Rupert, for the treatment of the silver-lead-gold ores of the northern provincial coast, as well, presumably, as of the northern country tributary to the Grand Trunk Pacific Ry. George McMillan and Colonel Coy, who are said to represent the company back of the enterprise, declare that the decision has not been reached hastily, that there has been an investigation extending over six or seven months, and that the promoters are satisfied that the tonnage of ore to be obtained and general conditions assure the success of the enterprise.

At Port Edward, the proposed site, there is the waterfront required for wharfage as it is intended that the company shall have several of its own vessels engaged in the transport of ore and there also is sufficient water for the operation of the proposed plant.

From Prince Rupert also comes an agitation for government action to the end that a metal refinery shall be established in British Columbia. A deputation waited on the Provincial Government recently advocating that this policy be pursued.

At the annual meeting of the Salt Lake Stock & Mining Exchange Fred C. Dern, of the firm of Dern & Thomas, was made president to succeed James A. Hogle, who remains on the board of governors. For the coming year W. H. Child is first vice-president; George Baglin, second vice-president; and H. W. Lane, third vice-president. Parker Norton was re-elected treasurer, and H. V. Altree secretary.

Fatal Accidents in Arizona in 1919 Totaled Sixty-two

State Inspector Bolin's Report Filed—Phelps Dodge Copper Queen Had Best Record

Sixty-two fatal accidents in 1919 and 1,127 others, not fatal, are listed by G. H. Bolin, state mine inspector of Arizona, in his annual report just filed with Governor Campbell. Apparently the list includes all bruises or minor contusions received by the mine workers. Just half the fatalities affected Mexican workmen. The causes almost entirely were set forth under these heads: Drilling into missed shots, premature blasts, falling down shaft, struck by cage, falling rock in stopes, and electrocution.

The best record was that of the Copper Queen branch of the Phelps-Dodge Corp., with no fatalities and with 165 minor injuries among 2,429 men. Old Dominion also had a clear fatality sheet, with 105 injuries listed. New Cornelia at Ajo had two men killed and forty-seven hurt. Arizona Copper at Clifton, three killed and 183 hurt; Calumet & Arizona, five killed and sixty-five hurt; Inspiration, six killed and 201 hurt; Miami, one killed and 116 hurt. United Verde, ten killed and twenty-nine hurt. The total number of men employed in or on mines for the year was 15,729, two-thirds of them underground.

The report, which is to have early publication, lists 107 operating mining corporations. Record is made of 126 mine inspections for the 12 months ended Dec. 1, 1919. No memorandum is made of any changes of operation made or suggested in the course of inspection, though the miners and managers are thanked for general assistance and co-operation.

International Nickel Reports

For the nine months ended Dec. 31, 1919, the International Nickel Co. reports net profits after charges and war taxes of $1,799,957, equivalent after deduction of preferred dividends to 83c. a share ($25 par value) earned on the $41,834,600 common stock, as compared with net profits of $5,072,458 or $2.79 a share in the corresponding period of 1918.

The consolidated income account for the nine months ended Sept. 30, 1919, compares with the corresponding quarters of previous years as follows:

Earnings: 1919, $4,236,897; 1918, $10,988,140; 1917, $11,797,235; 1916, $12,628,496.

Other income: 1919, $79,563; 1918, $109,465; 1917, $324,228; 1916, $216,-324.

J. C. Ralston has been elected president of the Washington State Metal Miners' Association, and E. H. Knight vice-president. The officers and George S. Bailey, of Republic, Dan P. Bagnell and Frank T. McCollough compose the executive committee. M. E. Poole was appointed acting secretary-treasurer. This is to be made permanent.

Cobalt Properties Tend Toward Amalgamation

Bailey Deal With Northern Customs To Be Consummated—Coniagas Buys Trethewey

The litigation in connection with the Bailey Mining Co., which has continued for the last ten years, has finally been settled in favor of the majority shareholders, and the deal with the Northern Customs Concentrators, Ltd., will now be consummated. A new company will be formed, which will take over both properties. It is difficult to see what the Northern Customs will be able to do with the Bailey at the present time, as its present milling capacity is all contracted for.

The deal for the purchase of the Trethewey by the Coniagas has been completed. The price paid for the property was $100,000, the Trethewey company reserving certain plant and machinery to be used at its Gowganda property.

The tendency, particularly in the west end of the camp, toward amalgamation of interests is quite marked. The Mining Corporation now owns and operates the Cobalt Lake, City-of-Cobalt, Townsite, Townsite Extension and the Buffalo, while the Coniagas, with the purchase of the Trethewey, has more than doubled its area. It is only natural to assume that the Coniagas will eventually take over the Hudson Bay, as the latter company's workings are connected with those of the Trethewey company.

As the mines become more and more dependent upon low-grade ore, it is natural that the smaller properties will fall into the hands of companies having large mills.

Rapid City, S. D., Gets Only Cement Plant in State

The Black Hills Rock Products Co. of Rapid City, S. D., has been incorporated and preparations are under way for establishing a Portland cement industry in this section of the State. The entire plant of the Dakota Portland Cement Co., at Chamberlain, has been purchased and is being moved to the new site in the Black Hills. There is a large acreage of suitable raw material for making cement around Rapid City and the construction of the new plant will be rushed and production will probably begin late this year. This will be the only cement plant in South Dakota, although it is likely that the state will engage in the same industry before long.

The State Cement Commission has under consideration various sites for State-owned cement plants and it is expected that some action will be taken in the near future looking to the manufacture of this material under State supervision.

The plant at Chamberlain is a modern one but it was found after the installation had been completed that the cement material was unsatisfactory for a uniform product and for that reason it was sold to the Black Hills concern.

Ontario Cyanide Plants Exempt From Municipal Taxation

Tisdale Township Loses Case Before Provincial Railway and Municipal Board

A judgment of more than usual interest to mining companies in Ontario has just been handed down by the Ontario Railway and Municipal Board in connection with the taxation of mining plants. The present assessment act, which was drawn before the cyanide process was used to any extent, specifically exempts concentrating plants from municipal taxation. The Township of Tisdale, in which are situated practically all of the Porcupine gold mines, claimed that cyanide plants did not come under the head of concentrators, and assessed them accordingly, with the expectation of increasing the township revenue by about $50,000 a year. The mining companies appealed to the Court of Revision, and the case finally came up before the Ontario Railway and Municipal Board, who decided in favor of the mining companies. It is understood that the township has decided not to carry the case any further.

Florida Phosphate Properties Sold to New Company

The Southern Phosphate Corporation, incorporated in Delaware in December, 1919, proposes to acquire, develop and work phosphate rock deposits. The corporation has already arranged to purchase for cash the properties of the Lakeland Phosphate and the Standard Phosphate companies located in Polk County, Fla., together with their modern plants. It also has a contract for the purchase of certain other neighboring properties, and expects to control the Export Phosphate Co. by issuing stock in exchange for the securities of that company. O. J. Ridenour, 25 Broad St., New York City, is president.

January Production Reports

Inspiration Consolidated Copper Co. produced 7,200,000 lb. of copper in January.

Miami Copper Co. produced 4,461,247 lb. copper in January.

Old Dominion Copper M. & S. Co.'s production in January was 2,504,900 lb. copper compared with 2,534,000 in December.

Phelps Dodge Corp.'s smelter at Douglas, Ariz., produced 7,962,000 lb. of blister copper in January as follows: 5,166,000 lb. from Copper Queen branch; 2,340,000 from Moctezuma Copper Co.; 10,000 from Burro Mountain branch; and 446,000 from custom ores.

Shattuck Arizona Copper Co.'s January output was 316,970 lb. copper, 740,595 lb. lead, 8,269 oz. silver, and 84.54 oz. gold.

Calumet & Arizona produced 3,240,000 lb. copper in January and New Cornelia 3,354,000 lb.

Anaconda Copper Mining Co.'s January output was 18,100,000 lb. copper compared with 3,300,000 lb. in December and 14,120,000 in November.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Merits of Metric System To Be Debated

New Bill, Seeking To Compel Government To Drop English Measures, Offers Chance for Discussion

Hearings are to begin in the near future before the House Committee on Coinage Weights and Measures on a bill which will make the use of the metric system compulsory after 1923 by the Government departments. The bill has been perfected by Representative Vestal of Indiana and specialists from the Bureau of Standards. It is to be introduced soon.

Mr. Vestal states that he is entering the hearings with an open mind and has no preconceptions whatever as to the merits of the controversy. The bill, he states, is to be used merely as a basis for the hearings, which are expected to extend over a considerable period. Mr. Vestal states that he has had numerous suggestions asking that the hearing be upon a bill making compulsory the adoption of the metric system throughout the country.

Bimetallism Urged by Senator Thomas, of Colorado

Declaring that foreign exchange had become the "sinister international problem" within the last six months and unless adjusted soon "commerical chaos" would overwhelm international trade, Senator Thomas, Democrat, of Colorado, urged in a speech on Feb. 10 the re-establishment of the old ratio between gold and silver and the creation of international bimetallism.

Mr. Thomas spoke on a resolution he has introduced for the creation of an American commission to co-operate with European commissions in arriving at a fixed ratio between gold and silver money. Such a commission, Mr. Thomas said, would be able to make the deflation which must come least harmful to the United States.

"The volume of paper currency increased over 500 per cent from 1914 to 1918," said Mr. Thomas. "The ratio of gold reserves to outstanding notes in 1914 was 70 per cent, in December, 1919, it was 13.7 per cent.

"Deflation is essential and must come sooner or later. But deflation has its train of miseries quite as oppressive and terrible as those now besetting a harried world, and while they cannot be avoided, they may be greatly mitigated by broadening the basis upon which all monetary systems ultimately rest.

"America has a superabundance of gold. It is needed elsewhere far more than here, yet we shrink from the thought of parting with it. It is still the fetish it ever was, and will be so long as it is the sole arbiter of value.

"We may—doubtless we must—lend our credit to those whose trade we need. But we cannot, save by mutual agreement for the fixity of exchange, whereby both gold and silver money of all the nations may possess a permanent relative value, remove the gambling element from international trade, stimulate international confidence in modern currency systems, make the passage of deflation comparatively easy and re-establish the regime of a saner and more dependable monetary medium."

War Minerals Claims Examined Too Strictly, It Is Held

Although much that the War Minerals Relief Commission has done meets with the approval of the House Committee on Mines and Mining, it became apparent, it is understood, at a session of the committee on Feb. 7, which was behind closed doors, that the committee is of the impression that the engineering feature of the commission's work is being conducted on an academic plane, which not only is retarding the work but is interfering with the equity of some of the awards. A majority of the members of the Committee on Mines and Mining seem to be of the impression that a "rule of reason" such as is followed by the courts in their interpretation of law should be allowed to exert itself more generally in matters handled by the War Minerals Relief Commission. The splitting of technical hairs, some of the members on the committee point out, is leading to interminable discussions and the committee is forming the opinion that it also is resulting in actual injustice to many claimants.

It is the hope of the committee that the hearings on the bill looking to the liberalization of the War Minerals Relief Act will have the effect of focusing the attention of the commission on some of its shortcomings. It is believed that the commission will be quick to profit by such criticism as is being made in the Committee on Mines and Mining. The committee apparently hopes to influence the commission so that more attention will be given to commonsense deductions rather than those based on ratios of built mills to planned mills and similar classes of deductions. The committee recognizes that such careful technical calculations must be made by engineers in planning enterprises, but the impression seems to be that the moral obligations of the Government in the matter of war mineral production can be settled equitably on broad practical grounds without going so deep into technical possibilities.

Conferees Make Little Change in General Leasing Bill

Chief Alteration in Section Relating to Disposal of Receipts—Early Passage Expected

Much to the surprise of those who have been following closely the legislation pertaining to the leasing of minerals the conferees on the part of the Senate who considered the General Leasing Bill agreed to a conference report which differs in only one important particular from the bill passed by the House. The important change was made in Section 35, which is one of the general provisions applicable to all leases. As agreed to in conference that section reads as follows:

"That 10 per cent of all money received from sales, bonuses, royalties and rentals under the provisions of this Act, excepting those from Alaska, shall be paid into the treasury of the United States and credited to miscellaneous receipts; for past production 70 per cent, and for future production 52½ per cent of the amounts derived from such bonuses, royalties, and rentals shall be paid into, reserved and appropriated as a part of the reclamation fund created by the Act of Congress known as the Reclamation Act, approved June 17, 1902, and for past production 20 per cent, and for future production 37½ per cent of the amounts derived from such bonuses, royalties and rentals shall be paid by the Secretary of the Treasury after the expiration of each fiscal year to the state within the boundaries of which the leased lands or deposits are or were located, said money to be used by such state, or subdivisions thereof, for the construction and maintenance of public roads or for the support of public schools or other public educational institutions, as the legislature of the state may direct. Provided, that all moneys which may accrue to the United States under the provisions of this Act from lands within the naval petroleum reserves shall be deposited in the treasury as miscellaneous receipts."

Public lands containing deposits of phosphate may be leased in tracts not to exceed 2,560 acres. The amount of royalty to be paid must be arranged with the Secretary of the Interior and is not to be less than 2 per cent of the gross value of the output of phosphate or phosphate rock. In addition, an annual rental is to be fixed which shall not be less than 25c. per acre for the first year, 85c. per acre for the second, third, fourth, and fifth years respectively, and $1 per acre for each year thereafter.

The report was adopted by the House on Feb. 10. The vote was 287 to

13, and there was little discussion.

Representative Sinnott, Republican, of Oregon, chairman of the House managers, said that the measure was the best of the many introduced in the past. Senator Smoot announced that he would bring up the report in the Senate on Feb. 11.

The Director of the Census announces that the enumeration of the nation's industry will start March 1, 1920.

Franklin K. Lane Resigns

The Secretary of the Department of the Interior, Franklin K. Lane, has tendered his resignation, to take effect March 1, 1920, which has been accepted by the President. This action finally confirms the correctness of reports long current and closes, for the time at least, Mr. Lane's public service of more than twenty years. He began his public career in the service of his home state of California, and has since held many positions of both state and federal rank, rising to the chairmanship of the Interstate Commerce Commission during his service thereon from 1905 to 1913, and finally receiving the offer of the portfolio of the Interior which he assumed March 5, 1913. Mr. Lane, though making his home in California, was born on Prince Edward Island, July 15, 1864. His administration of his office has been highly efficient and he has made many friends.

NEWS BY MINING DISTRICTS

ARIZONA

Work To Be Resumed at Roadside Mine —Receiver Sought for Mile-Wide Copper Co.

Tucson—At 470 ft., the shaft of the San Xavier Extension has cut an unexpected orebody of silver copper ore. The shaft is being sunk to 500 ft., at which depth there will be lateral development, to reach a known orebody that is to be cut about 150 ft. northwest. Carter Anderson, of Tucson, is making a geological survey of the property.

In the same section, the Midland company, in its North Star property, in passing through an 18-ft. body of sulphide, has crosscut another vein, carrying copper, silver and zinc.

The Sahuaro Copper Co. at San Xavier is sinking a new working shaft, through leached material, with occasional seams of limonite, running well in silver.

Work will be resumed soon on the Roadside mine, 40 miles southwest of Tucson, a property owned by Mrs. H. E. Huntington, who will be represented by Harold Wheelon. The property has been idle for about three years and the shafts are full of water. The deepest of the three shafts is down 400 ft. When the main shaft has been unwatered and retimbered, there is to be further development work in the copper sulphide ores, low-grade so far as developed. The ores carry some quicksilver. New hoisting and compressor equipment will be installed.

In cutting a station at 100-ft. depth, the Arizona-Tonopah has struck high-grade silver ore in its property eight miles southwest of Tucson.

Arthur Cooke is superintending extensive development work on the Beach property in the Baboquivari mountains. On the Silver Cloud claim, a tunnel has entered sulphides that are to supply a new mill, already contracted for. Friable chalcocite ore, running high in copper, is being sacked for shipment. In the same section, P. A. Roberts is preparing to sink a new shaft on the Altar-Cananea property.

Application has been made in the superior court for a receiver for the Mile-Wide Copper Co., with Charles P. Reiniger joined as defendant. He is charged with mismanagement and with trying to remove some of the equipment. The plaintiff is Ralph W. Langworthy, assignee of notes on which $7,000 is alleged due.

Ajo—A Detroit, Mich., association, represented by A. W. Bramwell, has purchased the realty and mill of the Gunsight Gold & Tungsten Mining Co. at New Gunsight. It is proposed to establish a ball mill and cyanide plant at Wall's Well and to do custom work, as well as treating the company's own ores. The present mill is a small one, originally designed to handle tungsten ores.

J. A. C. Martinez has resumed work on his mine near the Mexican border, a pioneer property with a very rich silver pay streak, carrying considerable lead.

Phoenix—A phenomenal strike is reported in the old Go John mine, in the Cave Creek district, 30 miles north of Phoenix. The real vein is said to have been overlooked by the pioneer owner, who had shipped much rich ore from a stringer. Hiram Linville of Phoenix recently cut through what appeared to be the footwall and found a ledge 3 ft. wide, from which, in three days, he and his associates took out 1,700 lb. of ore valued by a local assayer at $1 a pound. The vein samples 400 oz. silver and $24 in gold, with some copper. The find was made in a 300-ft. tunnel.

Ray—The Gila Development Co. is operating a new 30-ton mill of the Lane slow-speed type, with satisfactory results.

Superior—The property of the Silver King Extension Co. has been acquired by M. H. Jacobs, representing Rochester, N. Y., and Canadian capital.

Globe—Superior & Boston's 6th level crosscut has cut the Footwall lode, at which point the vein is 7 ft. wide.

The Arizona Commercial Mining Co. has cut over 10 ft. of excellent sulphide smelting ore on the 6th level opposite the new shaft. It has also cut the vein in the 16th-level crosscut where the face is in good smelting ore. The new shaft, which is 1,000 ft. east of the present Copper Hill shaft, is rapidly nearing completion.

Chloride—The Chloride Queen shipped a car of silver ore to the Humboldt smelter recently. Drifting on the present level will be continued for another hundred feet after which sinking will be resumed. The shaft has a depth of 256 ft. now and is to be sunk another 250 ft. Crosscuts will be driven every hundred feet as the shaft progresses.

Kingman—Active development at the Thumb Butte is in progress. A new air compressor, of 320-cu.ft. capacity, built by the Chicago Pneumatic Tool Co., has been installed recently. A 30-hp. engine and generator have been installed to furnish power for operating pumps and to light the mine and camp. Preparations are under way to unwater the Colorado shaft which has a depth of over 500 ft. As soon as this is unwatered and put in shape development work will be started from the lower levels. The property is in charge of Henry Johnson. The McCracken Silver Lead Co. has added two new concentrating tables to its mill. The mill produces about five tons of concentrates daily now. The last car of concentrates shipped gave 12 oz. silver and 62 per cent lead to the ton. Leonard Hoffman is in charge.

Oatman—At the Gold Ore property development has been resumed on the 650-ft. level. The shaft has been retimbered and most of the drift has been caught up. There remains a considerable amount of timbering to be done in the vicinity of the cave which has disclosed a new orebody of considerable importance.

ARKANSAS

Activity Reviving in Zinc and Manganese Fields in Northern Part of State

Batesville — The Manganese Cave Mines, which property consists of a 35-acre tract lying on the White River R.R., 25 miles north of Batesville, has been leased by Joe Magness and R. W. Earnhart. Active mining operations have been started. The property produces both low and high grade manganese ore.

The Ball manganese mine near Batesville, owned by Shepherd and Wilson and Texas associates, will start up soon. The property is equipped with a modern washing plant which was not fully completed until after the armistice was signed and which has never been operated. It is capable of producing a good tonnage of manganese ore.

Inquiries from Southern furnaces since Jan. 1 for manganese ore have created a new interest in the Batesville field and a good production is promised for this year. Joe Magness and R. W. Earnhart, who have leased the Manganese Cave Mines, have a contract for 6,500 tons. Shepherd and Wilson are negotiating now for the sale of the production from the Ball mine, and a number of other operators are also making arrangements to place their production and to start up.

Rush—The Beulah is in steady operation by the Arkansas Zinc Co. Con Medley has lately assumed the management. The property is making a good production of high-grade jack. Oil engines and an air compressor will be installed at once.

The Lonnie Boy Mining Co. has taken over a lease on the Edith mine in this camp and the company is now known as the Edith-Lonnie Boy Mining Co. The Edith is equipped with a modern 200-ton concentrator which is in operation. Ore from both mines will be milled at this plant. Both properties produce high grade zinc carbonates.

Pindall—The Big Hurricane mine at Pindall, owned by J. C. Shepherd, which has been idle for the last two years, was put into operation recently. The first ore shipments will be made about the middle of February. Two new drifts and a shaft have been started on the ore-bearing fault. The property is equipped with a concentrator of the Joplin type and a modern sludge mill.

Yellville—For the first time since late in 1918 the zinc mining industry in this field looks promising. A strong demand has developed for zinc carbonates. A number of smelter and chemical companies have had representatives in the field looking for ore during the last month. The price has advanced to $40 for 40 per cent ore, and some lots have been sold at a slightly higher figure. A number of the largest properties are being put into operation and others are cleaning up, and if the price remains satisfactory by spring the field will be making an average production. One of the most prominent factors entering into the revival of the industry is the fact that operators are now able to make production contracts with the buyers which assures them a market for their entire production.

CALIFORNIA

Idaho Maryland Unwatering Progressing—New Strike Reported at Dutch Mine

Grass Valley—The Placer Mines Co. has been incorporated here for the purpose of taking over several placer claims about 24 miles northeast of Grass Valley. The authorized capital stock of the company is $400,000.

The Alcalde mine, in the Rough & Ready district, is reported to have struck high-grade ore in the face of the drift.

The Idaho-Maryland mine is now dewatered to a point below the 600-ft. level. The shaft has been found in excellent shape.

Colfax—The Rising Star mine is now unwatered to a point just below the 600-ft. level.

Sutter Creek—The Central Eureka mine, for the week ended Jan. 24, reports that the 3,350 south drift is in 392 ft., with 6 ft. of quartz in the face. The 3,510 raise is up 86 ft. with 7 ft. of good ore in the top; the last assay at 79 ft. was $12.40 per ton. The face of the 3,700 drift is 368 ft. south of the cross-cut station, with 6 ft. of quartz in the face.

Nevada City—The Harmon Ridge tunnel, driven by the Penn-California Co., is now in 1,100 ft.

Jamestown—It is unofficially reported that the Dutch mine has opened up a vein averaging 6 ft. in width and assaying $15 gold per ton.

MINNESOTA

Operations on Mesabi and Cuyuna Ranges

Mesabi Range—The Hanna Ore Mining Co. is to strip the Wabigon forty at Buhl. There is deep overburden and shipments are not expected before 1923. Fourteen K & J 20-yd. steel dumps and a Jordan spreader have been purchased and additional equipment is sought. Buildings are to be started in the spring. This is a Great Northern lease.

Cleveland Cliffs, at Marble, and Butler Bros., at Nashwauk, have added locomotive cranes to their equipment.

Arcturus at Marble resumed sinking on Feb. 1.

Jones & Laughlin have decided to build a washing plant at the Hill-Annex, to include two 25-ft. logs, four 18-ft. logs, Deister baffle cone classifiers, Deister-Overstrom deck tables, and Dorr simplex classifiers. Allis-Chalmers are to furnish the equipment.

The New Wellington property of the Oliver Iron Co., at Chisholm is to be electrically operated. It is to have a concrete shaft, a 250-man dry house, and the steel head-frame from old Deacon.

The Shenango Furnace Co. has taken an option on the Virginia mine, an open pit in the Virginia district.

The Bowe-Burke has surrendered the lease on the Emmet, at McKinley.

Cuyuna Range—The Marquette Ore Co. which recently leased the Adams property on Section 4-46-29 has started sinking an incline shaft on the edge of the proposed open pit to serve as drainage shaft for the orebody.

Franklyn W. Merritt, at the annual meeting of the Merritt Development Co. in January, ousted the three men on the directorate from St. James, Minn., and resumed control of the company.

Preparations are being made to strip the Breitung at Trommald. The hydraulic and sandsucker outfit released by the completion of work at the Hillcrest has been purchased and is awaiting spring.

The Potts Exploration Co. is drilling on SW quarter, Sec. 26, Tp. 136 N., R. 26W.

Rogers-Brown are to electrify the Meacham & Kennedy.

SOUTHEAST MISSOURI

Conditions in Lead Belt

The wages throughout the Southeast Missouri lead belt were again advanced recently and are now up to the maximum that prevailed during the war. There is quite a shortage of labor which will become more pronounced with the opening of the spring season.

The Leadwood mine and mill of the St. Joseph Lead Co. was recently ordered to be started up and they are advertising for a thousand men for same. The Herculaneum smelter is not yet running full capacity on account of the labor shortage. The No. 4 new mill of the Federal Lead Co. will be started up as soon as they have sufficient force to operate it and the Nos. 9 and 10 shafts will shortly be reopened.

The Desloge Lead Co. is operating only two shafts, but expects to start up its No. 4 shaft soon.

Although the district ran very short of coal during the coal strike, which would have shut down the mines had it been prolonged much longer, it is now relieved from this dangerous condition and a full supply of coal is now being shipped in.

The very favorable and unusually high lead market has greatly stimulated activity and the output this year will probably show a marked increase over that of 1919.

MONTANA

Intermountain Engineering Co. Organized

Helena—Articles of incorporation have been filed with the Secretary of State by the Intermountain Engineering Development Co. The purpose of the organization is to handle the engineering work of properties under development, and to make examinations. It is not a "development" company in the sense of undertaking the development of properties in its own behalf. C. C. Sinnot is president and L. S. Ropes, manager.

NEVADA

Operations at Tonopah, Divide and Adjacent Districts—Consolidated Spanish Belt Building Mill Foundations

Tonopah—Operations in the mines of the Tonopah district were normal during the months of December and January. The Tonopah Mining Co. is preparing to re-open its mill at Millers, and it will be in operation in a few days. Developments in the mine, in the vicinity of old stopes as well as in other territory, is said to be very encouraging.

The Tonopah Extension Co. is retimbering its McCane shaft, and preparing to sink. This shaft will serve to improve ventilation throughout the deeper workings, and it is likely that

development work to the west will be done. This work will be important to the district as a whole and especially to the western portion.

The Belmont statement for the third quarter of 1919 shows net earnings of $44,511, which is low owing to the shutdown of six weeks caused by the strike and consequent delay in starting operations again. The Surf Inlet property of the company reports net earnings of $67,483 for the quarter. The Belmont received a dividend from the Surf Inlet property of $100,000.

The annual meeting of stockholders of the Fairview Extension, Fairview Round Mountain, and Round Mountain mining companies will be held in Tonopah on Feb. 16 to elect directors.

Divide—In the Divide district the Tonopah Divide mine continues its regular daily shipments to the MacNamara mill at Tonopah. Developments on the lower levels are satisfactory.

In the Divide Extension the ore shoot encountered in the south drift on the 200 level is holding up well. A few shipments have been made to the West End mill on which returns were very satisfactory. Several other properties in the district have reported favorable indications on which development work is being pushed.

There is considerable activity in outside districts, but no important new discoveries or developments have been reported. It is reported that the Arrowhead mine has encountered the rich ore shoot on the 175 level. Details as to size and value are lacking.

Belmont—To provide power for mine and mill a transmission line four and one-half miles long is being constructed from the main line of the Nevada California Power Co. to the Consolidated Spanish Belt mine near Belmont in Nye County. Excavating for the mill is nearly completed and pouring of concrete for foundations is under way. Two raises going up in the vicinity of San Pedro shaft are in good ore, the high-grade being shipped and the mill ore stored underground. The old Ernst stope, which is said to have produced much good ore in the old days, has been reopened and is being developed.

Reno—The two-compartment shaft being sunk on the Black Panther, a property three miles north of Reno, is down 170 ft. and crosscutting will probably be started at 200 ft.

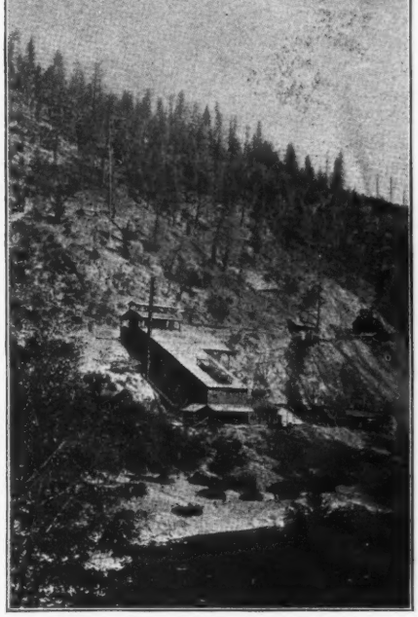
Lodi—Bruner Brothers, of Kansas City, have sold the mines and mill of the Lodi Mines Co., to J. L. Joseph, president of the Tonopah MacNamara company, and William Bliss, who has timber interests near Lake Tahoe. The property includes 29 claims and a small mill.

Majuba Hill—Charles P. Washburn has sold the Last Chance mine near Majuba Hill, twenty miles west of Imlay. Worked on a small scale the property has been making shipments of good silver ore.

National—Some good ore is reported as having been recently opened up in the Buckskin National in a lease worked by Vernon Bell and Erling Prout.

Goldfield—Seven feet of high-grade ore is reported by A. I. D'Arcy, general manager of the Goldfield Development Co., to have been opened up in a crosscut on the 400 level of the Combination mine, while alongside is a larger body of mill ore. The high-grade will be shipped to the smelters and the mill ore will be treated in the Goldfield Consolidated mill, the first section of which will be put in commission soon.

Loring—The Jose-Davis Mining Co. has resumed operations in the northern part of the Loring district. It is said to have funds enough to complete its small mill and develop the ore found on the Sheepherder.



PLANT OF ALMEDA COPPER MINE, ON ROGUE RIVER, 25 MILES FROM GRANTS PASS, ORE.

The Nevada Honey Bee, though it still has money in the treasury, is now idle.

Dayton—Owing to delays in getting the steel hull for the dredger, placer operations in Gold Canyon, above Dayton, will not begin as early as expected by Bulkeley Wells and associates. The company is transforming the building formerly used as High School annex in Dayton into comfortable club rooms for the employees. Shower baths are being put in, and books, magazines and newspapers will be provided for the men.

Pioche—Ore shipments from the Pioche district for the week ended Jan. 29 were as follows: Prince Consolidated, 850 tons; Virginia Louise, 650; Black Metals, 200; Cons. Nevada Utah, 150; Bristol Mines, 50; and Pioche Assay Office, 50. Total, 1,950.

NEW MEXICO

Co-operative Co. Erecting New Headframe—Cincinnati Property at Tres Hermanas Transferred

Lordsburg—The ore shipments from this district for January were 150 cars, 7,800 tons, valued at about $160,000.

The Co-operative Mining Co. is erecting a new timber headframe, 40 ft. high with a 40-ton ore bin attached; 2-ton skips will be used. The pumping plant for the mill is completed and the 80-ton mill closed in. E. H. Gould is superintendent.

The Ruby Silver Mining Co., recently incorporated, whose property adjoins the Co-operative, will start development work at once. Tom Lister is manager. The property has the reputation of having been a high-grade silver producer in times past.

The Miser's Chest is shipping its second car of gold-silver-copper ore to the El Paso smelter.

The Monte Rico Mining Co. has let a contract to drive its 5 x 7 tunnel 100 ft. further, and is also opening a good vein of silver-lead ore at the west end of their property. Lawrence Boyd is manager.

Silver City—The Silver Spots Mines Co. is down 70 ft. in its development shaft on Boston Hill. Iron ore has been encountered and shipments to the Colorado Fuel & Iron Co., Pueblo, Col., will begin at once. Robert I. Kirchman is manager.

Steeple Rock—The Duncan Mining & Milling Co. will proceed to patent ten claims. Their mill is reported completed. H. C. Spence is president.

John Christy reports that the net returns from the last four cars of ore shipped from his lease near Clear Lake, amounted to $12,000.

Tres Hermanas—The old Cincinnati property, the property of Messrs. Holt and Hoagland, has been taken over by Heath, Dean & Co. of New York. A company with a capital of $500,000 will be organized and eight other claims will be included. Work will be commenced at once. An 80-hp. Corliss engine, two 40-hp. boilers, three gas engines of 32, 40 and 50 hp. respectively, a 30,000 gal. redwood tank and two 4-ton four-wheel-drive trucks have been purchased. Donald MacKenzie examined the property and advised the purchase.

Development work will start shortly upon the Waterloo property in the same locality. The mine has a good showing of low-grade lead-silver pyritic ore ideal for flotation. Dr. S. S. Warren, of Deming, is the owner.

OREGON

Operations in Southwest Oregon

Grants Pass—Development work is being pushed on the Almeda copper mine on Rogue River 25 miles below Grants Pass with a view to erecting a reduction works. The mine is equipped with a 100-ton matting furnace. The ore carries copper principally, but also contains gold, silver, lead and zinc. The Almeda mine is more developed

than any other property in this region, owing in part to the fact that it is well situated for systematic development, being in the narrow but traversable canon of the river which cuts across the lode at a depth of 500 ft. The workings include 6,000 ft. of underground drifts at five different levels.

Waldo—The Queen of Bronze copper mine three miles east and south of Waldo has resumed shipping ore under lease to the Tacoma smelter. The mine is equipped with a 100-ton smelter, idle since 1914. During the war the mine shipped ore running better than 12 per cent copper to Tacoma, and the lower-grade ore was dumped to be reduced on the ground later. The wagon haul to the shipping point at the Water Creek station on the California-Oregon Coast railway is 27 miles long. The copper ores of this region are used for fluxing Alaskan copper ores.

Gold Hill—Among the mines now being re-opened and developed in this district are the Bina Danielson gold quartz mine, recently acquired by William A. Douglas, of Gold Hill, and situated four miles south of Gold Hill; the Newall gold quartz mine, seven miles southwest of Gold Hill, owned and operated by the Newall brothers, of Gold Hill; and the Copper Girl mine, nine miles west, owned and operated by A. T. McIvan, of Rogue River, Ore.

Operation of the 1,200-bbl. cement plant at Gold Hill has been resumed. This has been idle since 1916.

SOUTH DAKOTA

Hill City—Work has been resumed at the Cowboy mine of the National Tin Corporation. Suspension was necessary owing to shortage of coal. It is proposed to sink the shaft, which is now down 300 ft., to 500 ft. and to continue the lateral work. At Tin Boom deepening of the shaft continues. The ore has widened somewhat with depth and some good-grade material was encountered.

TEXAS

Temporary Fuel Shortage at Freeport Sulphur Co.'s Plant Relieved.

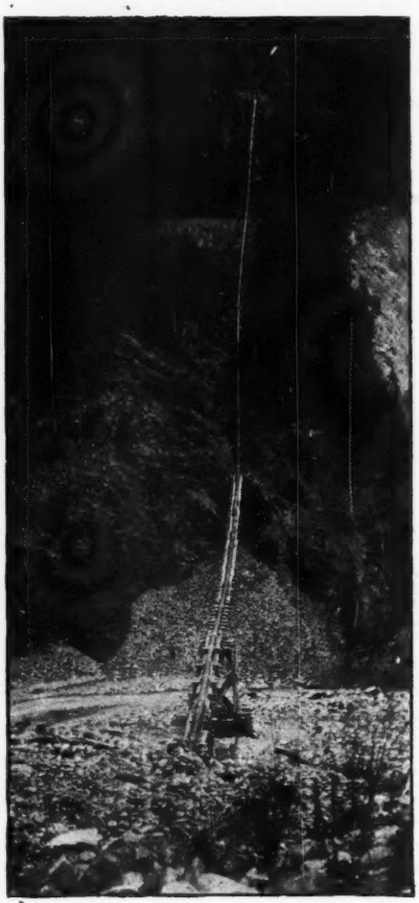
Freeport—Oil shortage at the sulphur plant, caused by the impossibility of barges crossing the bar at the mouth of the Brazos River, has been partly relieved by purchases from West Columbia and from the Southern Pacific Railroad. On Jan. 31 the first barge to cross the bar for a week or more was towed in with a small cargo of oil. The Freeport oil supply comes from Mexico, and the crude oil is topped for gasoline in a plant at the sulphur works before being used for fuel in the steaming plants.

UTAH

Daly West Stock Listed on Salt Lake Exchange—Western Utah Copper To Handle More Tungsten Ore

Salt Lake City—During 1919 the Utah Metal & Tunnel Co., of Bingham Canyon, produced 1,176,063 lb. lead; 74,115 lb. copper; 70,750 lb. zinc; 32,696 oz. silver; and 29 oz. gold. This brought, according to the company's report to the State Board of Equalization, gross returns of $94,521, of which $59,909 came from operations by the company and $34,612 from operations by lessees. Costs of extraction, reduction, transportation and construction amounted to $96,458, and the company had therefore no net proceeds to report.

This was also the case of the Utah Apex company, which reported total operating expense as $1,097,995 and gross receipts of $923,888, derived from the sale of 14,753,984 lb. lead; 7,671,742 lb. zinc; 2,257 oz. gold; and 195,715 oz. silver. This company is resuming milling operations, which have been intermittent for about a year, on Feb. 1.



PIPE LINE OF GAMBLE MINING CO. ACROSS WILD HORSE CREEK, FORT STEELE MINING DIVISION, BRITISH COLUMBIA

A recent shipment of 94 tons by the Emma Silver Mines, of Alta, after deducting smelter, freight, assay, and sampling charges, brought $6,866, the ore having run 61 oz. silver, 9 per cent lead, and 5 per cent zinc. Another shipment of 88 tons brought $5,532, the ore having run 51 oz. silver, 8 per cent lead, and 5 per cent zinc.

The Sells Mining Co. at Alta reports a strike of copper two to three feet wide, opened in a drift from the 125-ft. raise from the tunnel level. This company at its annual meeting elected V. S. Snow as director to succeed A. O. Jacobson, resigned to take up other work. John Zink is president.

Gold Hill—December shipments by the Western Utah Copper Co. near Gold Hill amounted to 62 cars and those for January are expected to reach 75 cars. The ore is lead-silver, and a good part of it is coming from a "glory-hole." The 700 level is also producing; here the vein is stated to vary up to 60 ft. in width, with 5 ft. of shipping and 50 ft. of low-grade ore. The capacity of the mill to treat tungsten ore is being increased. A recovery of 75 per cent tungstic acid is reported, as well as copper concentrates, running 7 to 8 per cent copper.

Park City—Shipments for the week ended Jan. 31 amounted to 4,639,530 lb. of ore and concentrates. The Daly West property is being opened up under the new management, which is the same as that of the Judge Mining & Smelting Co., and new ore is being developed, and shipments increased. The stock of this company, for a number of years listed on the Boston exchange, is also being listed on the Salt Lake Stock & Mining Exchange.

Eureka—Tintic shipments for the week ended Jan. 31 amounted to 149 cars as compared with 161 cars the week preceding.

The Independence Mining Co., which has claims located north of the Tintic Standard in East Tintic, expects to have machinery on hand soon with which sinking operations can be resumed. The main shaft is now down 70 ft., and it is understood the work will be continued under contract.

The Zuma is arranging to ship a car of ore over the Goshen Valley road which runs to the Tintic Standard and the Iron King, and will put this ore on the train near the Iron King after a haul of half a mile.

The Tintic Drain Tunnel company is providing steam power for one of the compressors at the shaft which it is sinking. A second compressor is provided with electric power.

The Standard has given a contract to have its shaft sunk to the 750 level. Some sinking has already been done and machinery is now installed for more rapid work.

The shaft of the Pinion Queen, which is being sunk under contract and progressing at the rate of 5 ft. daily, is down 450 ft., and some mineralization is reported.

Control of the Addie Mining Co. in the neighborhood of the East Tintic Consolidated, and the Eureka Bullion has been obtained by eastern men. Two shafts have been started on the property, in one of which it is said that ore was beginning to show when work was abandoned in 1914.

A new company, the Silver Star, owning 32 claims southeast of Silver City in the older part of the Tintic district, has been recently incorporated, at a capitalization of $10,000, divided into 1,000,000 shares.

The Dragon Consolidated is stated to be under contract to ship to the

smelters 100 tons of fluxing iron ore daily. This company is also shipping low-grade ore from ground under lease to the Tintic Milling company, and carrying on development. The latter company has recently made a shipment of silver bullion. Operations by this company are being favored by the high price of silver, and low-grade siliceous ores accumulated over a number of years in various properties are being worked. The company is taking all of the ore of this character offered.

WASHINGTON

Copper World Extension To Begin Diamond Drilling—C. E. Mallette Bids In Silver Basin Property

Loomis—The Copper World Extension mine near Loomis expects to begin systematic diamond drilling of the Copper World and Copper World Extension deposits soon.

Keller—The Iron Creek Mining Co., twelve miles northeast of Keller, has arranged to purchase the milling equipment of the old New Jersey mill from the Dubois Mining Co. Modern equipment will be added. The Iron Creek Co. reports a considerable tonnage of milling ore developed.

Springdale—The Aichan & Bee Mining Co., in the Deer Trail district twenty-five miles west of Springdale, is planning to erect a small experimental flotation mill.

CANADA

British Columbia

Premier Shipping Over Winter Trail—Rambler Cariboo Makes Final Payment for Jennie and Last Chance

Stewart—The Premier mine is making shipments over the winter trail. A 100-ton concentrator and flotation mill are to be installed, the machinery for which is being taken in now for shipment over the snow. It is purposed to set up the plant during the summer so that it will be ready for operation in the fall.

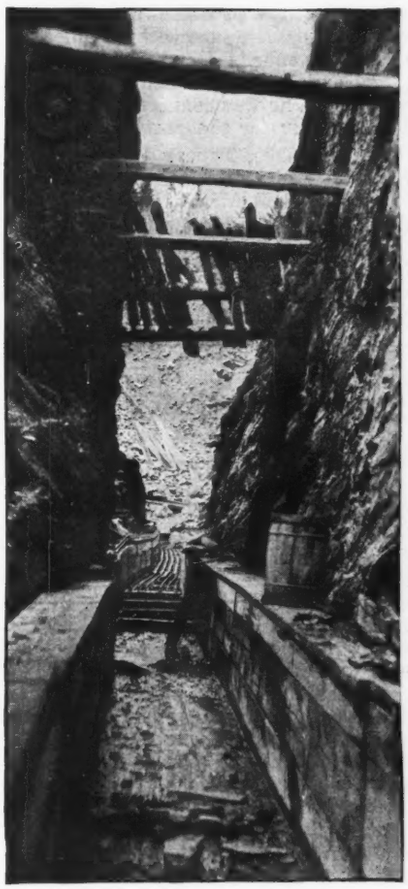
Trail—Ore shipments received at the Trail smelter during the week ended Jan. 31, 1920, are given as follows:

Mine	Location	Gross Tons
Bell	Beaverdell	37
Emma	Coltern	1,272
Florence	Princess Creek	91
Iron Mask	Kamloops	45
Josie	Rossland	182
Laurier	Laurier	31
Molly Gibson	Paulson	24
North Star	Kimberley	184
Paradise	Athalmer	91
Providence	Greenwood	34
Rossland Properties	Rossland	1,325
Second Relief	Salmo	42
Silver Bell	Zwicky	41
Standard	Silverton	415
Sullivan (zinc)	Kimberley	2535
		6,349

Sheep Creek—The announcement by the Nugget Gold Mines, Ltd., that its tunneling operations at Sheep Creek have been successful in striking at depth the vein of the old Mother Lode mine is considered of the utmost importance to mining in that section. The statement of R. H. Stewart, engineer in charge, is that the tunnel has crosscut a vein of good looking quartz, that the vein is twelve feet between walls, that there are three feet of good looking ore, the balance being crushed quartzite.

Three Forks—The Rambler-Cariboo Mines, Ltd., has completed its title to the Jennie and Last Chance claims by making the last payment of $25,000 on the purchase price of $60,000. The new ground gives the Rambler 1,650 ft. on the strike of the vein, which already has yielded between $2,500,000 and $3,000,000.

Victoria—It is stated that one of the matters to be taken up at Washington by Governor Riggs, of Alaska, upon his arrival there, will be the question of the construction of a railway from Hyder to the American border on the Salmon River. He also is to advocate improved roads for the district. C. F. Caldwell, a well-known British Columbia mining operator, is accompanying him.



SLUICE BOX CUT BY GAMBLE MINING CO. THROUGH SOLID ROCK, FORT STEELE MINING DIVISION, BRITISH COLUMBIA

The operations of the Gamble Mining Co. and the Wild Horse Dredging Co. in 1919 on the placer deposits of Wild Horse Creek in the Fort Steele mining division, British Columbia, created great local interest and speculation, according to the preliminary report of A. G. Langley, district engineer. The former company piped water across the creek and operated a monitor on some virgin ground on the west side. Owing to the unusual dryness of the season the shortage of water caused the cessation of operations during the latter part of the summer. However, results were sufficiently encouraging and work will be resumed next season.

Ontario

Kirkland Lake—The monthly report of the Lake Shore mine in Kirkland Lake for December shows that the mill treated 975 tons of ore, and recovered $14,637, or an average of $15 per ton. This is a smaller tonnage and about $8 lower grade than is usually shown. On account of the strike the company showed a deficit for the year.

Encouraging reports continue to come from the Kirkland Lake Gold regarding developments on the lower levels. A rich shoot carrying tellurides has been opened up.

The Wood-Kirkland is the name of a new company organized by the Buffalo people to develop 300 acres south of Mud Lake.

MEXICO

Guanajuato

New Mill Begun for Guanajuato R. & M. Co.—Santa Rosa Stamp Mill Opened—Pinguico Co. May Build Tram at Esperanza Group

La Luz—The Guanajuato Reduction & Mines Co., of Guanajuato, has started construction work on a 200-ton mill for the purpose of treating the ore from its properties in the La Luz district. This will be known as the San Pedro Unit and will be a 20-stamp ball and tube mill, all sliming, countercurrent plant. It is expected that the mill will be completed and in operation within the next five or six months. August MacDonald is the superintendent in charge of construction.

George W. Bryant, accompanied by E. H. Emerson and R. B. Hill, mining engineers of New York City, have been examining the properties of the Asuncion Co. of La Luz, preparatory to equipping them for a daily production of about 1,000 tons.

Guanajuato—The Pinguico Mines Co. has completed the unwatering of the mines known as the Esperanza Group at Santa Ana, Guanajuato. The results of the examination have been favorable and it is very probable that in the near future an aerial tramway will be constructed to connect the mines up with the San Matias mill of this company at Guanajuato, where the ore will be treated. Keith A. Cunningham is general manager of the Pinguico Mines Co.

Irving Herr succeeds Mr. Lerschen as general superintendent of El Cubo Mining & Milling Co.'s property at Cubo, Guanajuato.

Santa Rosa—On Jan. 19 the 15-stamp mill of the Cia. Metalurgica de Santa Rosa was formally opened. This mill has been erected by Mexican and foreign capital for the purpose of treating the ore from the mines of the Santa Rosa district. Christopher Bartholomai is the superintendent in charge.

MEN YOU SHOULD KNOW ABOUT

F. F. Sharpless was in Salt Lake City the latter part of January.

Harry E. Guggenheim has left New York on his way to Valparaiso.

A. Charles Meagher is now residing at 6 W. 75th St., New York City.

George J. Young, Western Editor of the *Engineering and Mining Journal*, is in New York.

W. C. Capron, of the Andes Copper Co., sailed from New York on Jan. 31 for Antofagasta, Chile.

A. W. Allen, recently connected with the *Engineering and Mining Journal* staff as milling editor, has returned from Chile.

A. L. Flagg, of Kelvin, Ariz., was engaged in field work in southern California during January.

L. F. S. Holland is examining mining properties in Colorado, and expects to return to Los Angeles about the middle of February.

B. C. Yates, superintendent of the Homestake Mining Co., at Lead, S. D., is in New York City on business connected with his company.

Edgar Wallower, of Joplin, has been elected governor of the Joplin Chapter of the American Mining Congress, succeeding Victor Rakowsky.

L. D. Adams, general manager of the Weedon Mining Co., and Zinc Co., Ltd., of Quebec, Canada, will spend the month of February visiting the mines.

William C. Potter, accompanied by Mrs. Potter and family, was a passenger on the "Santa Luisa," which left New York on Jan. 31 for Antofagasta.

U. S. Strome, a director of the Marigold Mining Co. of Rice Lake, Manitoba, is making a tour of the United States to interest American investors in that district.

Keith Roberts, who has been engaged in diamond drilling in the Porcupine area, has gone to South America, where he has obtained a position with the Guggenheims.

W. T. McKee has resigned as director and secretary-treasurer of the Imperial Oil Co., of Toronto. He has been engaged in the oil business in various capacities for forty-five years.

Fred E. Bendelari and Douglas Corner, of Joplin, and Charles E. Schwarz, of Miami, have been elected vice-governors of the Joplin Chapter of the American Mining Congress.

Arthur G. Henry, metallurgist for the Illinois Tool Works and secretary of the American Steel Treaters' Society, has resigned to become Chicago representative of the Vanadium Alloys Steel Co.

Marion H. Merriss is now assistant general superintendent of the Nichols Copper Co., whose refinery is situated at Laurel Hill, Borough of Queens, New York City. Mr. Merriss' address is 2 Lake St., Jamaica, Long Island, N. Y.

R. B. Moore, chief chemist, U. S. Bureau of Mines, was in Golden, Col., during the latter part of January, in connection with the co-operative work on oil investigations undertaken by the State of Colorado and the Bureau of Mines.

H. Lipson Hancock, general manager, Wallaroo & Moonta Mining & Smelting Co. of South Australia, is making a visit to the principal copper mining and smelting centers of the United States. He expects to sail from San Francisco some time in March.

Hjalmar E. Skougor has returned to private practice as consulting industrial engineer, having severed his connection with Guggenheim Brothers, Chile Exploration Co. and Braden Copper Co., with whom he was connected as designing engineer for the past seven years.

D. E. Stubbs, Deputy U. S. Mineral Survey, Aniak, on the Kuskokwim River in central Alaska, is in New York and Washington for the purpose of securing from the Government assistance in further opening up to mining the region drained by this great river, the second largest in Alaska.

OBITUARY

William J. Richards, formerly in charge of the Michigan mines of the McKinney Steel Co., died suddenly in St. Petersburg, Fla., on Jan. 19, aged fifty-eight years. He was one of the best known of the mining men of the Lake Superior district. He entered the mining business in the Michigan copper field when a young man, going later to the Mesabi and Gogebic ranges. For a time he was in active charge of some of the largest of the mines on the Mesabi Range. Mr. Richards retired two years ago and went to live in Battle Creek, Mich. He was a former president of the Lake Superior Mining Institute. Mrs. Richards, one daughter and six sons survive him. Several of the sons are engaged in mining work in the Lake Superior district.

Richmond Levering, head of the Richmond Levering Co., Inc., oil engineers, died on Jan. 28 of influenza and pneumonia at his residence in New York City. Mr. Levering was born in Lafayette, Ind., thirty-eight years ago, was educated at Andover Academy and Yale, being graduated from that college in the class of 1902. He devoted himself to the petroleum industry, developing oil fields and building refineries in this country, Mexico, and in other foreign countries. Mr. Levering was the designer of the oil sea-loading system now in use on the coast of Mexico. He organized and was for many years president of the Indian Refining Co. and also organized the Port Lobos & Island Oil & Transport corporations. In 1914 Mr. Levering organized the Richmond Levering Co., Inc.

SOCIETY MEETINGS ANNOUNCED

Northwest Mining Convention will be held in Spokane on Feb. 16-21, 1920.

American Association of Engineers will hold its sixth annual convention at the Planters Hotel, St. Louis, on May 10 and 11, 1920.

American Association of Engineers.—The Bisbee (Arizona) Chapter of the American Association of Engineers was organized on Jan. 22, with about seventy-five members and applicants.

The Canadian Mining Institute will hold its twenty-second annual general meeting on Mar. 8, 9, and 10, 1920, at the King Edward Hotel, Toronto, Ont. C. W. Knight, of the Bureau of Mines, Toronto, is secretary of the local committee.

Material Handling Machinery Manufacturers' Association announces a change in the date of its forthcoming convention from Jan. 29 and 30 to Feb. 26, and 27, 1920. The convention is held at the Waldorf Astoria Hotel, New York, details of the program to be announced later. Manufacturers from any part of the United States are welcome, especially those who are interested in overhead, locomotive, gantry cranes, hoists, winches, portable, gravity and power conveyors, industrial trucks, tractors and trailers, bulk-handling machinery, elevators, and all forms of equipment and supplies used in the construction and operation of mechanical handling machinery. Zenas W. Carter, 35 West 39th St., New York, is secretary of the Association.

American Mining Congress has announced that its official publication, the *Mining Congress Journal*, in 1919 made a net profit of more than $5,000. It has been decided to spend this entire sum in the enlargement and perfection of the *Mining Congress Journal*. Several new departments will be started, including one devoted to patents, in charge of John Boyle, Jr., who was connected with the U. S. Patent Office for fifteen years.

The Institution of Mining and Metallurgy has announced the following awards made by its Council: (1) Gold medal of the Institution (premier award) to H. Livingstone Sulman, in recognition of his contribution to metallurgical science, with special reference to his work in the development of flotation and its application to the recovery of minerals; (2) The Consolidated Gold Fields of South Africa, Ltd., gold medal to William Henry Goodchild, for his papers on "The Economic Geology of the Insizwa Range" and "The Genesis of Igneous Ore Deposits"; (3) The Consolidated Gold Fields of South Africa, Ltd., premium of forty guineas to Dr. Edward Thomas Mellor, for his paper on "The Conglomerates of the Witwatersrand."

INDUSTRIAL NEWS

Westinghouse Electric International Co. has recently opened a new office in the Royal Bank of Canada Building in Havana, Cuba. J. W. White will be in charge, and will be assisted by other special engineers.

Waclark Wire Co. has sold its plant in Elizabeth, N. J., to the American Copper Products Co. The Waclark company, which manufactures various wire products and operates a brass mill, was controlled by Ex-Senator Clark, and consequently used a part of the production of the United Verde Copper Co.

Hardinge Conical Mill Co. announces a change in name to the Hardinge Co. This change of name does not mean that the company is in any way eliminating the conical mill from its efforts, but it was considered desirable on account of the recent enlargement of its activities and a desire to simplify the corporate name.

Frank F. Foley, formerly associated with the Westinghouse Electric & Manufacturing Co., and later with the Edison Storage Battery Co., as manager of the mining department and assistant sales manager for two years, has opened an office and permanent exhibit at the Grand Central Palace as Eastern Sales Manager, Mancha Storage Battery Locomotive Co.

Dwight Manufacturing Co., 12-14 So. Jefferson St., Chicago, is making a simple, ingenious device for counting drum revolutions in such a way as to record the travel of a hoist, elevator, or the like. Besides the usual pin for actuating the counter wheel, additional devices provide that, when the direct motion of the drum is reversed, movement in that direction shall not be recorded by the counter. This therefore gives, at the end of any period, the total cable movement in one direction, from which may be calculated the total for both directions, a desirable item in studying relative endurance of cables.

The Truck Owners' Conference, of which Harold P. Gould is chairman, is distributing the National Standard Truck Cost System, which has been developed by truck owners and manufacturers to provide an accurate and unbiased method of recording and analyzing costs and other data connected with the operation of motor trucks. The system is presented in the form of a folder, each folder containing sufficient blanks for one truck for one year, together with full instructions. These may be obtained from the Truck Owners Conference, 5 South Wabash Ave., Chicago, Ill., at 50c. each.

Corporacion Minera de Famatina, an Argentine corporation with main office at Buenos Aires and mines and smeltry at Chilecito, Argentina, has opened offices at 120 Liberty St., New York City, for the purchase of mining and smelting equipment. Changes and additions to the present plant will be made in order to adapt it to the latest metallurgical practice. Output is a blister copper unusually rich in silver and gold. The design of the new installation will be under the direction of Bancroft Gore, who has recently returned from South America.

Chicago Pneumatic Tool Co. on Jan. 21 and 22 held a general conference of executives, plant and branch managers and salesmen at its Detroit plant, on the occasion of the formal opening of a large five-story addition. At this conference the expansion program of the company for 1920 was outlined, calling for largely increased production not only at Detroit but at the five other American plants of the company. It was reported that much of the proposed increase in production was already absorbed by orders for future deliveries. The nation-wide chain of service stations which the company has opened and supplied with complete stocks of spare parts, machinery and tools, and provided also with facilities for handling territorial repairs for users of the company's products, was also outlined in detail.

TRADE CATALOGS

Insuring Full Return on Truck Investments. Cutler-Hammer Manufacturing Co., Milwaukee and New York. Publication 806; 8½ x 11; 4 pp.; illustrated. This leaflet describes and illustrates the new C-H Automatic sectional type of battery-charging equipment for charging battery-driven vehicles, trucks and locomotives.

Type "B" Portable Belt Conveyors. Portable Machinery Co., Passaic, N. J. Folder; 6 x 9; 4 pp.; illustrated. Describes portable belt conveyors for handling material horizontally or at a slight incline, and gives prices of these machines, which are made with 16-in. wide belt, and in standard stock sizes as follows: 12 ft., 6 in.; 16 ft.; 19 ft. 6 in.; 23 ft.; 26 ft. 6 in.; 30 ft.; 33 ft. 6 in.; and 37 feet.

Brown Pyrometers. Brown Instrument Co., Philadelphia, Pa. Catalog No. 12. 8 x 10½, 88 pp., illus. This is an elaborately illustrated catalog, giving in practical form and plain language a great deal of information on the subject of pyrometry. It also gives valuable information regarding resistance thermometers, recording thermometers, pressure gages, draft gages, tachometers, time and operation records, and other instruments produced by the Brown company.

Massco Mechanical Rubber Goods. The Mine & Smelter Supply Co., 42 Broadway, New York. 7 x 10; 44 pp.; illustrated. An attractive booklet on the "Massco" brand transmission, conveyor and elevator belting; air-drill hose; steam and water hose; packing; pump valves; molded rubber goods; and laboratory rubber tubing. The company announces a radical change in method of marketing; mechanical rubber goods formerly sold under factory brands are now placed on the market backed by the "Massco" trademark.

NEW PATENTS

U. S. Patent specifications may be obtained from the Patent Office, Washington, D. C., at 10c each.

Concentration of Ores. Edwin Edser and Henry Livingstone Sulman. (1,326,855. Dec. 30, 1919.)

Concentrator. Henry Bolthoff. (1,327,902; Jan. 13, 1920.)

Copper, Process for Hardening. Frederick H. Ruth. (1,326,693; Dec. 30, 1919.)

Cyaniding—Precipitation of Metals from Solutions. Arthur Gordon. (1,323,588; Dec. 2, 1919.)

Diaspore, Process of Treating. Otis Hutchins, assignor to The Carborundum Co. (1,326,595; Dec. 30, 1919.)

Electric Furnace—Three-Phase Electric Furnace. Frederick T. Snyder, assignor to Industrial Electric Furnace Co. (1,327,174; Jan. 6, 1920.)

Electric Furnaces—Control of Power Absorbed in Electric Furnaces. Colin Clarence Gow and Donald Fraser Campbell. (1,327,548; Jan. 6, 1920.)

Electroconverter Furnace. Paul Francois Sarron and Jules Simon. (1,325,114; Dec. 16, 1919.)

Flotation Apparatus. John F. Myers, assignor to The New Jersey Zinc Co. (1,323,373; Dec. 2, 1919.)

Flotation Apparatus—Walter O. Borcherdt, assignor to The New Jersey Zinc Co. (1,326,174; Dec. 3, 1919.)

Furnace-Slagging Apparatus. Earl W. Clark. (1,329,293; Jan. 27, 1920.)

Graphite—Process for Producing Flake Graphite. Samuel W. Osgood. (1,328,845; Jan. 27, 1920.)

Iron—Process for the Direct Production of Refined Iron and Refined Steel from Titaniferous Iron Ores. Johannes Jacobus Loke and Willem Alexander Loke. (1,328,636; Jan. 20, 1920.)

Iron—Process of Directly and Completely Transforming and Reducing Iron Ores into Iron, Steel, or Cast Iron. Gaspard Jakova-Merturi. (1,329,055; Jan. 27, 1920.)

Jig. James B. Barbee and Otto J. Cross. (1,328,778; Jan. 20, 1920.)

Loading and Unloading Apparatus. Arthur S. Hecker. (1,327,324; Jan. 6, 1920.)

Loading — Mine Loading Machine. Frank Billings. (1,328,487; Jan. 20, 1920.)

Loading Vessels, System and Apparatus for. George H. Hulett and Frank E. Hulett, Cleveland, Ohio. (1,327,327; Jan. 6, 1920.)

THE MARKET REPORT

Published simultaneously in San Francisco and mailed from there to our Western subscribers as a special service pending the arrival of the *Engineering and Mining Journal*

Silver and Sterling Exchange

Feb	Sterling Exchange	Silver		Feb.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
5	326	132	86⅞	9	336½	133	88½
6	339	132½	88	10	335	133½	88¾
7	331¾	132½	89	11	335½	134	89½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Daily Prices of Metals in New York

Feb.	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
5	18.50@18.60	56⅞@57	57	8.50@8.75	8⅜@8.42½	8.45@8.50
6	18¼@18½	56⅜@56½	57½	8.50@8.75	8⅜@8.45	8.45@8.50
7	18¼@18½	56⅜@56½	58	8¾	8.50@8.60	8.45@8.50
9	18¼@18½	56 @56¼	58	8.75@8.80	8.50@8.60	8.45@8.50
10	18¼@18½	56 @56¼	58½	8.75@8.80	8.50@8.60	8.50@8.60
11	18¼@18½	56¾@57	58 @58¼	8.75@8.80	8.50@8.60	8.50@8.65

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Feb.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
5	120¾	122½	126	390	390½	48⅜	48⅞	61½	62⅝
6	121¼	123¼	127	391½	392¼	48¾	49¼	61½	63¼
7	....	....	...	....	....	...	...	...	...
9	121¾	123¾	128	392½	392¾	49⅛	49⅞	62	63½
10	121½	123½	128	393	393½	49⅜	50	62	64
11	120¼	122¼	128	391¾	392½	49½	50¼	62¼	64¼

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

METAL MARKETS

New York, Feb. 11, 1920

During the last week the copper market was largely speculative, but a considerable volume of business was transacted. Lead became slightly higher but quiet and inactive; and zinc slightly lower and more active.

Copper

The copper market the last week was almost entirely in the hands of the outside dealers and speculators. The big producers held firm at 19@19¼c. asked, but made practically no sales. Their position is fairly comfortable on account of heavy recent sales. Domestic consumers are also well stocked up. The domestic consumption is good, but if the car shortage on the railroads were remedied it would be greater. Export business is chaotic, on account of the existing foreign-exchange situation.

Transactions estimated as possibly amounting to several million pounds took place in the outside market at prices ranging from 18¾ to 18½c.; and this therefore established entirely our quoted price for the week.

Copper Sheets—No change in base price of 29½c. per lb. set early in January. Wire 22½c. per lb.

Tin

The tin market has been demoralized, owing to holders of nearby tin being forced to liquidate. However, very little tin was sold during the week. Today there is a temporary improvement, and some buying. Forward tin was sold as high at 60c., and was usually quoted about 1c. higher than spot.

On Feb. 9, 200 tons arrived from Liverpool, and on Feb. 10, 450 tons arrived from Singapore.

Lead

The principal producers on Saturday advanced their official price to 8¼c. St. Louis and 8½c. New York. There was considerable activity last week around the prices quoted in our table, but this week there has been little business, the general market having remained close to the official figure quoted. Small sales were reported in New York as high as 9c., but this did not affect the general average. Large lots are offered at the prices indicated by our quotations both for spot and April-May-June delivery, without much buying. Some of the producers are pretty well sold out.

Zinc

The weakening of the zinc market continued during the latter part of last week, but this week the market received support, the decline was checked and the demand continued fair and stationary around 8¼c. St. Louis. Sales for forward delivery—March, April, and May—were the same as spot, indicating a stationary market without trend. The export market continues weak.

The market for high-grade zinc was reported slightly firmer.

Last week's report quoted St. Louis zinc at 8.60@8.80c., which was in error, and should have been 8.50@8.70c. per lb.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots. Slightly higher prices for export. Unchanged.

Gold, Silver and Platinum

Gold—Transvaal gold in London rose Thursday to 127s. 4d.; on Friday declined to 123s. 6d., which price held until yesterday, when it was quoted at 123s.

Canadian gold mines are making a good profit out of the exchange situation by selling their output in the United States and thus taking advantage of the 16 per cent premium on the dollar. This amounts to nearly $4 an ounce on gold. In the case of the Hollinger mine, it is estimated that the premium means an extra $136,000 monthly.

Gold in small lots is flowing out of the country, decreasing the reserve of the Federal Reserve Bank. Shipment of $7,500,000 will go to the Argentine next week.

Foreign Exchange.—Was quoted yesterday as follows: The pound sterling at $3.35½; francs at 14.51 to the dollar; Italian lire at 18.27 to the dollar; marks, (German) were down to 1.03c; Austrian kronen to .31c.

Silver—The tone of the London market the last week has been firm and steady, exchange on London having shown a tendency to hold at $3.35 per pound (sterling) the last few days. Silver has been in request at current prices for the China market.

The Indian government has removed the embargo on silver imports for private account.

Mexican dollars at New York: Feb. 5 to Feb. 11 inclusive, 102¼.

Platinum—$155 per oz. Market a little quieter.

Palladium—$130@$135 per oz.

Iridium—Quoted nominally at $300.

Other Metals

Aluminum—Producers are asking 33c. per lb., but some small sales of virgin metal are reported under that figure.

Antimony—Market continues good, at prices which will average about 11⅞c. Futures shaded slightly.

Bismuth—Unchanged at $2.50 for 500-lb. lots.

Cadmium — Unchanged at $1.40 @ $1.50 per lb. Market quiet.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c. Unchanged.

Quicksilver—Quoted price unchanged at $80, but it is doubtful if much can be had for less than $85 per 75-lb. flask. San Francisco wires $80, steady.

Other Ores and Minerals

Chrome Ore—Few offers, and previous quotation of 75c. per unit for 50 per cent ore still reflects the market.

Manganese Ore—Demand is active with price around 80c. per unit for high-grade ore. See last week's quotation.

Molybdenum Ore—70c. per lb. Mo S_2 for high-grade concentrate was reported for two small lots.

Feldspar — Manufacturers reported sold up until end of the year. Difficulties in transportation, cold weather, and labor are further crippling this commodity. The Government price of $18 still prevails.

Fluorspar—Lump ore containing 85 per cent CaF_2 and not over 5 per cent SiO_2 is quoted unchanged at $16 f.o.b. mines at Tonuco, N. M.

Barytes—This mineral is still scarce. Contracts are not binding, as they may be broken by either party; if the cost of production increases after the contract is made the producer may raise the price, but the buyer also has the privilege of refusing the goods if the price is too high. White, $34@$36 per ton; off-color, $22@$28 per ton.

Graphite—Ceylon grades are quoted unchanged: Lump, 15@16c.; chip, 11@12c; dust, 8@9c. Domestic flake about 10c. per lb. Mexican ore running 80@85 per cent amorphous carbon brings about $60 per ton. Crucible manufacturers report business poor, and are not buying.

Nitrate—Unchanged at $3.70 per cwt. Practically no spot supplies.

Pyrites—Spanish pyrites is quoted at 16c. per unit for furnace-size ore, free from fines, c.i.f., Atlantic ports.

Sulphur—Prices average $18 per ton for domestic and $20 for export, f.o.b. Texas and Louisiana mines. Practically no change in past two or three months.

Tungsten Ore—Sales of Chinese wolframite for week again increased at prices of $6@$6.25 per ton for Chinese ore. Probably 500 tons bought in last two weeks, largely by speculators. High-grade Bolivian ore brings $7@$7.50. Settlement of tariff situation will probably change prices materially.

Ferromanganese continues active, both in demand and price. One large firm with works in Pittsburgh district has quoted as high as $170 gross ton, other quotations varying from $160@$165. Actual sales at these prices are reported heavy and firm. A steady rise to $200 is looked for by men in the New York end of the industry.

Spiegeleisen remains firm in price. Demand is rather brisk and a sympathetic rise is expected. The quotation of $55@$60 f.o.b. Pittsburgh district still in force.

Ferrosilicon holds firm on all grades; 50 per cent, $85 gross ton; 75 per cent, $150; and 10@15 per cent, $65@$70; all quotations being f.o.b. Pittsburgh district.

Zinc and Lead Ore Markets

Joplin, Mo., Feb. 7—Zinc blende, per ton, high, $56.90; basis 60 per cent zinc, premium, $51; Prime Western, $55@$50; fines and slimes, $47.50@$45; calamine, basis 40 per cent zinc, $35. Average settling price: blende, $53.09; no calamine reported.

Lead, high, $102.60; basis 80 per cent lead, $100; average settling price, all grades, $98.43 per ton.

Shipments the week: Blende, 12,335; lead, 2,063 tons. Value all ores the week, $859,030.

The stock market slump was quickly reflected in bids on zinc ore, but no change in lead prices was announced. Reports were current today that some buyers were offering only $47.50 for Prime Western tonight, but rumors of sales on that basis remain unverified. Premium offerings are lower than early week quotations on Prime Western, as the buyers of this grade made no purchases until today. Following the stock market decline, one of the heaviest producers offered a large zinc tonnage on $50 basis, and sold a quantity before the market broke to offerings of $47.50.

Platteville, Wis., Feb. 7—Blende, basis 60 per cent zinc, $60 base for premium grade bid and refused on Monday and no sales for the week. Prime Western grade sold at $51 base. At the week end lead ore, basis 80 per cent lead, $100 per ton. Shipments reported for the week are: Blende, 1,538; calamine, 90; lead, 44; sulphur ore, no tons. For the year to date the totals are: Blende, 9,082; calamine, 450; lead, 749; sulphur ore, 30 tons. During the week 2,559 tons blende was shipped to separating plants.

Iron Trade Review

Pittsburgh, Feb. 10, 1920

The trade has been surprised by the reports showing that pig-iron production increased nearly 15 per cent from December to January. There has been such loud complaint of coke shortage and of disorganized traffic conditions generally that it was naturally assumed production had been curtailed. The fact was, on the contrary, that production increased. A 15 per cent increase in pig iron in one month is quite unusual, and it is probable that steel production increased in somewhat greater ratio.

At many steel plants there have been accumulations of finished steel, awaiting shipment and held back by insufficient car supply. At some moderately large plants the accumulations amount to 50,000 or 75,000 tons, and altogether it is safe to estimate that in the Central West there is more than half a million tons of material at plants awaiting cars. The difficulty as to the transportation is not that the railroads are functioning less than formerly, but that they are unable to increase their service with anything like the rapidity desired by the iron and steel industry.

The situation in the steel market as a whole remains that there are some stabilizing influences, but that there is in substance a runaway. The Steel Corporation has no direct following in its adherence to March 21 steel prices, but two large independents are with it in theory, to the extent that they are holding their products at prices substantially equal to the prices ruling before the March 21 reductions. All other sellers seem anxious to secure the highest steel prices obtainable.

Pig Iron—With a heavy demand, all the basic iron available at $40, Valley, was cleaned up a few days ago, and on demand continuing there was a jump to $43, Valley, which is now the quotable market. Bessemer remained quotable at $41, Valley, until today, when some business has gone through at $42.

Steel—There is no clear-cut market, each transaction being a law to itself. Sheet bars are quotable at $65@$70. Small bessemer billets have brought over $60.

Coke—Coke production in the Connellsville region continues at its well-established rate, there being no increase in car supplies, but the output of byproduct coke continues to increase steadily. Some coke can be bought in the open market, but not much. The market remain quotable at Government limits, $6 for furnace, $7 for foundry and $7.30 for crushed, per net ton at Connellsville ovens.

Ferrosilicon — Electrolytic remains steady at $80 for 50 per cent and $140 for 75 per cent, delivered. Bessemer ferrosilicon remains at $59.50 for 10 per cent, $62.80 for 11 per cent, and $66.10 for 12 per cent, f.o.b. Jackson, Ohio.

MINING STOCKS

Week Ended Feb. 7, 1920

Stock	Exch.	High	Low	Last	Last	Div.
COPPER						
Adventure	Boston					
Ahmeek	Boston	72	70	70	Dec. '19,	$1.00
Alaska, B. C.	N. Y. Curb	1	1/16	3/4		
Algomah	Boston			†*40		
Alloues	Boston	37	35	35	Mar. '19,	1.00
Anaconda	N. Y.	61½	55⅝	57½	Nov. '19,	1.00
Ariz. Com	Boston	13⅝	12	12½	Oct. '18,	.50
Big Ledge	N. Y. Curb	¼	7/16	½		
Bingham Mines	Boston	7	7	7	Sept. '19,	.25
Boston & Ely	Boston Curb					
Butte & Bal	Boston	25	*25	*25		
Butte & Lond	Boston Curb			†*12		
Calaveras	Boston Curb			†*1		
Calumet & Ariz	Boston	63¾	60	60½	Dec. '19,	.50
Calumet & Hecla	Boston	390	370	370	Dec. '19,	5.00
Calumet & Jerome	N. Y. Curb			†¼		
Can. Copper	N. Y. Curb	1 7/16	1¼	1 5/16		
Centennial	Boston	15	14½	14½	Dec. '18,	1.00
Cerro de Pasco	N. Y.	55½	46	50	Dec. '19,	1.00
Con. Ariz	N. Y. Curb			7/8	Dec. '18,	.05
Con. Copper M.	N. Y. Curb			4⅛		
Chile Cop	N. Y.	18½	16½	17¼		
Chino	N. Y.	37⅛	34⅛	35⅛	Dec. '19,	.75
Cliff	Boston					
Cop. Range	Boston	45⅛	43	43½	Dec. '19,	.50
Crystal (old)	Boston Curb	9	4	†*4		
Crystal Cop	Boston Curb					
Daly-West	Boston	4	3⅛	3⅞		
Davis-Daly	Boston	12	10½	11	Dec. '19,	.50
East Butte	Boston	14⅛	12⅛	13	Dec. '19,	.50
First Nat'l	Boston Curb			*1½	Feb. '19,	.15
Franklin	Boston	3⅛	3⅛	3⅛		
Granby	N. Y.	48	45½	46½	May '19,	1.25
Greene-Can	N. Y.	35	32⅛	33¼	Feb. '19,	1.50
Hancock	Boston	5	5	5		
Helvetia	Boston	3⅛	2⅞	2⅞		
Houghton	Boston Curb			2		
Howe Sound	N. Y. Curb			†3¼	Jan. '20,	.05
Inspiration	N. Y.	56⅛	50⅜	53	Jan. '20,	1.50
Indiana	Boston			†*50		
Iron Cap	Boston Curb	11	10	10	Feb. '19,	.25
Isle Royale	Boston	34	32	32	Sept. '19,	.50
Jerome Verde	N. Y. Curb			†7/16		
Kennecott	N. Y.	30⅛	28	28⅛	Dec. '19,	.50
Keweenaw	Boston	1⅝	1⅝	1⅝		
Lake Copper	Boston	4	3⅛	3⅛		
La Salle	Boston	3	3	3		
Magma Chief	N. Y. Curb			⅜		
Magma Copper	N. Y. Curb			†30	Jan. '19,	.50
Majestic	Boston Curb	17	17	†*17		
Mason Valley	N. Y. Curb	2⅜	2⅛	2⅛		
Mass Con	Boston	5⅛	4⅞	5	Nov. '17,	1.00
Mayflower	Boston	8⅛	7	8⅛		
Miami	N. Y.	24⅜	21⅛	21½	Nov. '19,	.50
Michigan	Boston	7¼	7	7		
Mohawk	N. Y. Curb			67⅞	Nov. '19,	1.00
Mother Lode (New)	N. Y. Curb	5⅛	5⅛	5⅛		
Nev. Con	N. Y.	16	14⅛	14⅞	Dec. '19,	.37½
Nixon Nev	N. Y. Curb			*18		
Nev. Douglas	Boston Curb			†10		
New Arcadian	Boston	4	3⅞	3⅞		
New Baltic	Boston Curb			†3⅜		
New Cornelia	Boston	21⅛	19⅛	19⅛	Nov. '18,	.25
North Butte	Boston	18	15⅝	16½	Oct. '18,	.25
North Lake	Boston	*75	*50	*60		
Ohio Copper	N. Y. Curb			†1/16		
Oneco	Boston Curb			†*60		
Ojibway	Boston	2	1⅞	1⅞		
Old Dominion	Boston	34⅛	32	32	Dec. '18,	1.00
Osceola	Boston	52	49	49	Dec. '19,	1.00
Quincy	Boston	61	57	59	Dec. '19,	1.00
Ray Hercules	N. Y. Curb			†1⅛		
Ray Con	N. Y.	21	19⅛	20⅛	Dec. '19,	.50
Seneca	Boston	16⅛	14	14⅛		
St. Mary's M. L.	Boston	54	47	47	Dec. '19,	2.00
Shannon	Boston	1⅜	1⅛	1⅜	Nov. '17,	.25
South Lake	Boston			†1½		
South Utah	Boston			†*18		
Shattuck Ariz	N. Y.	12⅛	11⅛	11⅛	Jan. '20,	.25
Superior	Boston	5	4⅜	4⅜	Apr. '17,	1.00
Superior & Boston	Boston	5⅛	4⅛	5		
Tenn. C & C	N. Y.	11⅛	9⅛	9⅞	May '18,	1.00
Trinity	Boston	2	2	2		
Tuolumne	Boston	1⅛	0.97	0.97		
United Verd. Ex	Boston Curb	40⅛	37⅛	37⅛	Nov.' 19,	1.50
Utah Cop	N. Y.	75	71	72	Dec. '19,	1.50
Utah Con	Boston	9⅛	8⅜	8⅜	Sept. '18,	.25
Utah M. & T.	Boston	2⅜	2⅛	2⅛	Dec. '17,	.30
Victoria	Boston					
Winona	Boston	1⅜	1⅜	1⅜		
Wolverine	Boston	20	18⅛	18⅛	Jan. '20,	.50
LEAD						
Hecla	N. Y. Curb	4⅜	4⅛	4⅜	Dec. '19,	.15
St. Joe Lead	N. Y.	16⅛	15⅛	15⅜	Dec. '19,	.25
Stewart	Boston Curb			*15	Dec. '15,	.05
Utah Apex	Boston	2⅜	2⅛	2⅞	Nov. '18,	.25

Stock	Exch.	High	Low	Last	Last	Div.
ZINC						
Am. Z. L. & S.	N. Y.	18⅛	15½	17	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.			58½	Feb. '20,	1.50
Butte C. & Z.	N. Y.	9⅛	7⅛	8⅛	Jul. '18,	.50
Butte & N. Y.	N. Y. Curb			*75		
Butte & Superior	N. Y.	25½	22	23½	Sept. '17,	1.25
Natl. Z. & L.	Boston Curb	*8	*7	*7	May '17,	.02
Success	N. Y. Curb	*6	*5	*6	July '16,	.03
GOLD						
Alaska Gold	N. Y.	1⅛	1⅛	1⅛		
Alaska Juneau	N. Y.	2	1⅛	2		
Booth	N. Y. Curb	*6	*5	*6		
Carson Hill	N. Y. Curb	29½	22	24½		
Cresson Gold	N. Y. Curb	2⅛	1⅞	2	Dec. '19,	.10
Dome Ex	Toronto	‡30⅛	‡28⅛			
Dome Lake	Toronto	‡15	‡13			
Dome Mines	N. Y.	12⅛	10⅛	11	Jan. '20,	.25
Goldfield Con	N. Y. Curb	15	12	13	Dec. '19,	.05
Hedley	Boston				Jun. '19,	.10
Hollinger	Toronto	‡7.00	‡6.75		Dec. '19,	.05
Homestake	N. Y.			60	Sept. '19,	.50
Kewanas	N. Y. Curb	*3	*3	*3		
McIntyre Porcupine	Toronto	‡2.10	‡2.05		Jan. '20	.05
Silver Pick	N. Y. Curb	*10	*5	*8		
Teck-Hughes	Toronto	‡19	‡18			
United Eastern	N. Y. Curb	4	3 1/16	4	Jan. '20,	.21
West Dome	Toronto	‡9	‡8			
White Caps	N. Y. Curb	*12	*11	*12		
Yukon Gold	Boston Curb			*1⅛	June '18,	.02½
SILVER						
Adanac	Toronto	‡*5	‡*3			
Bailey	Toronto	‡*6	‡*5½		Apr. '16,	.05
Beaver Con	Toronto	‡64	‡63			
Coniagas	Toronto	‡3.00	‡3.10		Nov. '19,	.12½
Crown Reserve	Toronto	43	33	38	Jan. '17,	.05
Hargraves	Toronto	‡*4	‡*3½			
Kerr Lake	Boston	4½	4½	4½	Sept. '19,	1.00
La Rose	N. Y. Curb	⅛	⅛	⅛	Apr. '18,	.02
McKinley-Dar	N. Y. Curb	*65	*65	*65	Jan. '20,	.03
Nipissing	N. Y. Curb	11¼	10	10	Jan. '20,	.50
Ontario Silver	N. Y.	8	7	7⅛	Jan. '19,	.50
Ophir Silver	N. Y. Curb	1⅞	1⅛	1⅛		
Peterson Lake	Toronto	‡*21½	‡*20½		Jan. '17,	.01½
Sil. King Ariz	N. Y. Curb	1/16	1/16	1/16		
Temiskaming	Toronto	‡*43	‡*42		Jan. '20,	.04
Trethewey	Toronto	48½	47	47½	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*3¼	*2½	*2½		
Batopilas	Boston			†1½		
Bost. & Mont.	N. Y. Curb	*74	65	67		
Cashboy	N. Y. Curb	*9½	*8	*8		
El Salvador	N. Y. Curb	3⅛	3	3		
Goldfield Merger	N. Y. Curb	*4	*3	*3		
Jim Butler	N. Y. Curb	26	23	24	Aug. '18,	.07
Jumbo Extension	N. Y. Curb	*7	*6	*7	June '16,	.05
Louisiana	N. Y. Curb	⅛	⅛	1/16		
MacNamara	N. Y. Curb	1/16	¼	¼		
Nev. Packard	Boston Curb				Apr. '19,	.02
Rochester Mines	N. Y. Curb			†*22	Oct. '18,	.02
Tonopah-Belmont	N. Y. Curb	3	2⅛	2⅞	Jan. '20,	.05
Tonopah Ex	N. Y. Curb	2⅛	2 3/16	2⅛	Jan. '20,	.05
Tonopah Mining	N. Y. Curb	2 3/16	2⅛	2⅛	Oct. '19,	.15
West End Con	N. Y. Curb	2	1⅛	1⅛	Dec. '19,	.05
SILVER-LEAD						
Caledonia	N. Y. Curb	*39	*35	*36	Jan. '20,	.01
Fed. M. & S.	N. Y.	10⅜	10⅛	10⅜	Jan. '09,	1.50
Fed. M. & S. pf.	N. Y.	32⅞	28	30	Dec. '19,	.50
Iron Blossom	N. Y. Curb	1/16	1/16	1/16	Jan. '20,	.02½
Marsh Mines	N. Y. Curb	*25	*21	*22		
Rex Con	N. Y. Curb	*8	*7	*8		
Simon S. L.	N. Y. Curb			†1⅛		
Stand. S. L.	N. Y. Curb	⅜	1/16	1/16	Oct. '17,	.05
Wilbert	N. Y. Curb	*7	*6	*6½	Nov. '17,	.10
NICKEL-COPPER						
Internat'l Nickel	N. Y.	24⅛	20⅛	22⅛	Mar. '19,	.50
Internat'l Nick. pf.	N. Y.	88	88	88	Feb. '20,	1.50
QUICKSILVER						
New Idria	Boston	7⅛	5⅛	6	Jan. '19,	.25
MANGANESE						
Man. M. of Am.	N. Y. Curb					
TUNGSTEN						
Mojave Tungsten	Boston Curb	10	5	8		
VANADIUM						
Vanadium Corpn.	N. Y.	53	45⅜	49		
GOLD AND PLATINUM						
So. Am. G. & P.	N. Y. Curb	8	7⅛	7⅛		
MINING, SMELTING AND REFINING						
A. S. & R.	N. Y.	67⅛	62⅛	64⅛	Dec. '19,	1.00
A. S. & R., pf.	N. Y.	97⅛	95⅛	96	Dec. '19,	1.75
Am. Sm. pf., A	N. Y.	82	80½	80½	Jan. '20,	1.50
U. S. Sm. R. M.	N. Y.	71	65½	67	Jan. '20,	1.50
U. S. Sm. R. & M., pf.	N. Y.	46⅛	46	46	Jan. '20,	.87½
Natl. Lead	N. Y.	82	76	77⅛	Dec. '19,	1.25⅛
Natl. Lead, pf.	N. Y.			†105	Dec. '19,	1.75

*Cents per share. † Bid price on Feb. 7 ‡ Asked and bid price, Feb. 9

CURRENT PRICES OF MATERIALS AND SUPPLIES

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	3.55–4.00	4.64	4.82	5.80	$5.32–7.00	5.17
No. 12	3.60	4.69	4.67	5.75	5.37–7.10	5.22
No. 14	3.65–4.10	4.74	4.92	5.90	5.42	5.27
Black:						
Nos. 18 and 20	4.15–4.65	5.24	5.80	6.75	6.80–7.30	6.02
Nos. 22 and 24	4.20–4.70	5.29	5.85	6.80	6.85–7.35	6.07
No. 26	4.25–4.75	5.34	5.90	6.95	6.90–7.90	6.12
No. 28	4.35–4.85	5.67	6.00	7.05	7.00–8.00	6.22
Galvanized:						
No. 10	4.70	5.79	5.97	....	6.90	6.87
No. 12	4.80	5.89	6.07	7.30	6.95	6.92
No. 14	4.80	5.89	6.07	7.30	7.10	6.97
Nos. 18 and 20	5.10	6.19	6.37	7.60	7.40	7.27
Nos. 22 and 24	5.25–5.75	6.34	6.52	7.75	7.80	7.12
No. 26	5.40–5.90	6.49	6.95	7.90	7.95	7.27
No. 28	5.70–6.20	7.04	7.25	8.20	8.25–9.00	7.57

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard bessemer rails	$45.00	$55.00	$45.00	$65.00
Standard openhearth rails	47.00	57.00	47.00	67.00
Light rails, 8 to 10 lb.	2.585*	3.135*	2.585*	3.135*
Light rails, 12 to 14 lb.	2.54*	3.09*	2.54*	3.09*
Light rails, 25 to 45 lb.	2.45*	3.00*	2.45*	3.00*

*Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, ⅝ in. and larger	$3.35	$3.70	$3.62	$4.44	$5.65
Track bolts	4.90–5.10	4.90	4.62	Premium	6.65
Standard section angle bars	2.75	3.25	2.75	3.44	4.60

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	New York Current	New York 1 Year Ago	St. Louis	Chicago
Beams, 3 to 15 in.	$2.45	$3.47	$4.27	$3.54	$3.47
Channels, 3 to 15 in.	2.45	3.47	4.27	3.54	3.47
Angles, 3 to 6 in., ¼ in. thick	2.45	3.47	4.27	3.54	3.47
Tees, 3 in. and larger	2.45	3.52	4.27	3.54	3.47
Plates	2.65	3.67	4.52	3.54	3.67

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.65	$2.65	$4–5

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Year Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
½ in. and larger	$4.20	$5.00	$5.675	$4.72	$4.99	$6.15	$7.50
CONE HEAD BOILER							
½ in. and larger	4.30	5.10	5.75	4.82	5.09	6.25	7.50
⅜ and 7/16	4.45	5.25	5.90	4.97	5.24	6.40	7.50
⅜ and ½	4.70	5.60	6.25	5.32	5.49	6.75	7.75

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand special and cast steel	20%
Patent flattened strand iron rope	5%
Plow steel round strand rope	35%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

San Francisco: Galvanized, less 5%, bright, less 25%.
Chicago, +5 on galvanized, 30–2½ off on bright.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Birmingham
Straight	$5.75	$7.50	$6.75	$7.25	$7.00
Assorted	5.85	7.50	6.90	7.50	7.25

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh:
Iron bars, $4.00 Steel bars, $3.00

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Chicago
$0.12	$0.16½	$0.18	$0.19	$0.14½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham
Solid	14c.	13c.	15c.
Hollow	17c.	.....	.....

STEEL AND IRON PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing cars of National Tube Co. for steel pipe, Cardry A. M. Byer's for iron, both dated Mar. 21, 1919.

BUTT WELD

Inches	Steel Black Per Cent.	Steel Galvanized Per Cent.	Inches	Iron Black Per Cent.	Iron Galvanized Per Cent.
⅛ to 3	57½	44	⅛ to 1¼	30	23½
LAP WELD					
2	50½	35	1½	24½	9½
2½ to 6	53½	41	1½	31½	17½
7 to 12	50½	37	2	32½	18½
13 and 14	41	....	2½ to 6	34½	21½
15	38½	....	7 to 12	31½	18½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
⅛, ¼ and ⅜	46½	29	⅛, ¼ and ⅜	28½	11½
½	51½	39	½	33½	20½
¾ to 1¼	55½	43	¾ to 1½	39½	24½
2 to 3	56½	44			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	48½	37	1½	25½	10½
2½ to 4	51½	40	1½	31½	17½
4½ to 6	50½	39	2	33½	20½
7 to 8	46½	33	2½ to 4	35½	23½
9 to 12	41½	28	4½ to 6	34½	22½
			7 to 8	26½	14½
			9 to 12	21½	9½

From warehouses at the places named the following discounts hold for steel pipe:

	New York	Black Cleveland	Chicago
⅛ to 3 in. butt welded	47%	43½%	57½%
3½ to 6 in. lap welded	42%	45½%	53½%
	New York	Galvanized Cleveland	Chicago
⅛ to 3 in. butt welded	31%	34½%	44%
3½ to 6 in. lap welded	27%	30½%	41%

Malleable fittings, Class B and C, from New York stock sell at list plus 22½%. Cast iron, standard sizes, net.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	List	$0.80	$1.00	$1.25	$1.45	$0.98
Hot pressed hexagon	List	0.80	1.00	1.05	1.45	0.78
Cold punched square	List	2.50	1.00	.75	1.05	1.30
Cold punched hexagon	List	2.50	1.00	.75	1.05	1.30

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	70–5%	50–10%
Chicago	50%	50%
Cleveland	60–10%	50–10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	30%	50%	35–5%
Larger and longer up to 1 in. by 30 in.	20%	40%	25–5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York, $1.50 Cleveland, $3.75 Chicago, $3.00
For cast-iron washers the base price per 100 lb. is as follows:
New York, $7.00 Cleveland, $3.75 Chicago, $4.25

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	$84.00	$82.00	$86.00	$84.00
Tar pitch (in 400-lb. bbl.)	21.00	18.00	22.00	19.00
Asphalt pitch (in barrels)	34.00	34.00	37.50	37.50
Asphalt felt	88.00	88.00	90.00	90.00

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25
No. 2 grade	1.70	1.95	2.15	2.40	2.50	2.75

Asbestos asphalt-saturated felt (14 lb. per square) costs $170 per ton.
Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $3.00 per roll in carload lots and $3.25 for smaller quantities.
Shingles, red and green slate finish, cost $7.25 per square in carloads, $7.50 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
St. Paul	$0.087	$0.158	$0.248
Seattle	.09	.175	.30
Los Angeles	.082	.154	.236
New Orleans	.165	.22	.325
Cincinnati	.101	.18925	.2864
Birmingham	.072	.135	.....
St. Louis	.08	.15	.....

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20-Ft. and Under				12 x 12-In. 20 Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	$75.00	$65.00	$65.00	$60.00	$110.00	$100.00
Kansas City	53.00	52.25	52.25	52.25	64.00	52.25
Seattle	.....	31.00	.....	.....	.....	31.00
New Orleans	45.00	.....	.....	.....	48.00	.....
St. Paul	60.00	59.00	59.00	46.00	42.00	56.00
Atlanta	62.50	64.50	66.00	76.00	79.50	82.00
Baltimore	53.10	.....	.....	.....	62.00	.....
Cincinnati	55.00	55.00	55.00	.....	62.50	60.00
Montreal	73.00	68.00	65.00	60.00	73.00†	73.00
Los Angeles*	.....	59.50	58.00	.....	.....	51.00

	1 In. Rough, 10 In. x 16 Ft. and Under			2 In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
Boston	$70.00	$60.00	$60.00	$80.00	$65.00
Kansas City	115.25	89.75	89.75	117.25	92.75
Seattle	.....	33.00	.....	.....	36.00
New Orleans	54.00	.....	.....	55.25	.....
St. Paul	53.00	53.00	53.00	63.00	57.50
Atlanta	85.00	90.00	.....	77.50	87.50
Baltimore (box)	45–46.00	.....	.....	45–50.00	.....
Cincinnati	60.00	57.00	60.00	60.00	55.00
Montreal	65.00	65.00	65.00	66.00	66.00
Los Angeles*	.....	57.00	56.00	.....	.....

* Base price, 2 x 45, is $45, Los Angeles.
† Montreal—Up to 32 ft., over which, $3 per M. increase up to 36 ft.
Detroit—2x4x16 Y.P. is $48. For other sizes, add freight to Chicago quotations.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Dallas	Chicago	San Francisco
Wire	$4.50	$3.90	$6.90	$4.15	$5.50
Cut	....	5.85	6.40	7.00	6.90

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

	Current	One Month Ago	One Year Ago With Bags
New York (delivered)	$2.80	$2.80	$4.00
Jersey City (delivered)	2.47	2.47	3.64
Boston	2.42	2.42	3.67
Chicago	2.00	2.00	3.05
Pittsburgh	2.05	2.05	3.15
Cleveland	2.32	2.32	3.32

NOTE—Charge for bags is generally 15c. each, 60c. per bbl.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200-lb. Barrel	
	Finished	Common	Finished	Common
New York	$17.50	$14.50	$2.75*at plant	$2.55*
Kansas City	25.50	21.00	2.30	2.30
Chicago	18 00	17.50	1.80	1.10
St. Louis	22.00	18.00	.....	2.00
Boston	22.00	18.25	2.70*	3.40*
Dallas	30.00	.....	2.75	....
San Francisco	30.00	.....	2.80†	....
St. Paul	23.00	20.00	1.60	1.50
New Orleans	.....	17.50	.....	2.20
Atlanta	.....	1.90 (bbl.)	1.80	1.95

NOTE—Refund of $0.10 per barrel.
* 300-lb. barrels. † 180-lb. barrels.

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	Year Ago	Current	Year Ago
Raw per barrel (5 bbl. lots)	$1.80	$1.49	$1.98	$1.66
5-gal. cans	2.00	1.74	2.23	1.86

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

	Red				White	
	Current		One Year Ago		Current Dry and In Oil	1 Yr. Ago Dry and In Oil
	Dry	In Oil	Dry	In Oil		
100-lb. keg	15.00	16.50	13.00	14.50	15.00	13.00
25- and 50-lb. kegs	15.25	16.75	13.25	14.75	15.25	13.25
12½-lb. keg	15.50	17.00	13.50	15.00	15.50	13.50
5-lb. cans	16.50	18.50	.....	.....	17.00	15.00
1-lb. cans	17.50	19.50	.....	.....	18.00	16.00

MINING AND MILLING SUPPLIES

HOSE—

	FIRE	50-Ft. Lengths
Underwriters' 2½ in.		$0.75 per ft.
Common, 2½-in.		40

	AIR		
	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.50	$0.33	$0.22

STEAM—DISCOUNTS FROM LIST

First grade..... 30% Second grade.... 40% Third grade..... 45%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	20%	25%
St. Louis	40%	35%
Chicago	45%	40%
Birmingham	35%	30%
Cincinnati	30–5–2½%	40–2½%

RAWHIDE LACING—25% off for cut; $0.86 per sq.ft. for ordinary.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to $0.02 extra while for quantities amounting to less than 600 ft. there is an extra charge of $0.01. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft., ⅝-in., 6; ¾-in., 4½; 1-in., 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ½ in. and larger, in 1200-ft. coils:

Boston	$0.30	Kansas City	.265
New York	.26	New Orleans	.255
Cincinnati	.275	Seattle	.25
Chicago	.265	St. Louis	.26
St Paul	.275	Atlanta	.295
San Francisco	.24		

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$1.00
Asbestos for high-pressure steam	1.70
Duck and rubber for piston packing	1.00
Flax, regular	1.20
Flax, waterproofed	1.70
Compressed asbestos sheet	.90
Wire insertion asbestos sheet	1.50
Rubber sheet	.50
Rubber sheet, wire insertion	.70
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.30
Asbestos wick, ½- and 1-lb. balls	.85

REFRACTORIES—Following prices are f.o.b. works:

Chrome brick	net ton	$90–$100	at Chester, Penn.
Chrome cement	net ton	45–50	at Chester, Penn.
Clay brick, 1st quality fireclay	1000	36–45	at Clearfield, Penn.
Clay brick, 2nd quality	1000	30–35	at Clearfield, Penn.
Magnesite, dead burned	net ton	32–50	at Chester, Penn.
Magnesite brick, 9x4½x2½ in.	net ton	80–90	at Chester, Penn.
Silica brick	1000	41–45	at Mt. Union, Penn.

Standard size fire brick, 9x4½x2½ in. The second quality is $4 to $5 cheaper per 1000.
St. Louis-Fire clay, $30 to $40.
Birmingham—Fire clay, $41-$44; silica, $46.50-$54.50; magnesite, $80-$85; chrome, $80 to $90.
Chicago—Fire clay, high grade $50, standard $40.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago—Plain	$1.48	$1.33
San Francisco—Douglas fir, green	1.61	1.14
San Francisco—Douglas fir, creosoted	3.23	2.28

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98	No. 5	.87
7x9x8 white oak	1.05		
7x9x8 red oak, No. 4	.80		

FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbls.:

	New York	Chicago In Bbl.	Chicago Carloads
Pure steam-distilled pine oil, sp.gr. 0.93–0.94	$1.45	$1.50	$1.45
Pure destructively distilled pine oil	.....	1.50	1.45
Pine tar oil, sp.gr. 1.025-1.035	.40	.38	.37
Crude turpentine, sp.gr. 0.900–0.970	1.60	2.18	2.05
Hardwood creosote, sp.gr. 0.96–0.99*	.35	.....	.....

*F. o. b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago		
White	13.00	11.00-13.00	14.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	8.50–12.00	11.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x13½
Cleveland	$52.00	$58.00
Chicago	41.00	43.50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	.....	$0.27	$0.295	.....	$2.20
Boston	$0.2225	.2425	.2675	$0.3100	2.20
Kansas City	.185	.2275	.2525	.29	2.25
New Orleans	.2375*	.2275	.2475	.....	.....
Seattle	.1675	.1925	.2125	.2775	2.10
Chicago	.1825	.2075	.25	.2925	2.15
St. Paul	.185	.2275	.2525	.....	2.25
St. Louis	.185	.2275	.2325	.2950	1.80
Dallas	.189	.....	.288	.342	2.75
Los Angeles	.25	.30	.35	.....	3.00
Atlanta	.22	.245	.265	.....	2.55
Baltimore	.19	.2325	.2875	.30	2.35
Cincinnati	.1825	.2075	.2275	.....	2.10
Montreal	.28	.31	.34	.38	3.90

* For 50%.

CHEMICALS

SODIUM CYANIDE—New York price is 31c. per lb.; Chicago, 27c.; St. Louis, 31c; Birmingham, 45c.

SODIUM SULPHIDE—New York price per pound is 5c. for concentrated, 3c. for crystals. Chicago, 6c. for concentrated, 3c. for crystals. Birmingham price is 35c. for crystals. Concentrated comes in 500-lb. drums; crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 11c. per lb.; Chicago, 13c.; St. Louis, 12c; Birmingham, 35c.

ALUMINUM DUST—Chicago price is $1.10 per lb.; Birmingham, $1.52.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points.:

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union 25-Lb. Per Ton
East of the Mississippi, North of Chattanooga	$106.00	$101.00	$1.52
Southeastern portion U. S. A.	115.50	110.50	1.63
Texas (except El Paso)	124.00	119.00	1.74
El Paso, Texas	126.00	121.00	1.77
Denver, Colo	124.00	119.00	1.74
West Coast	129.00	124.00	1.81